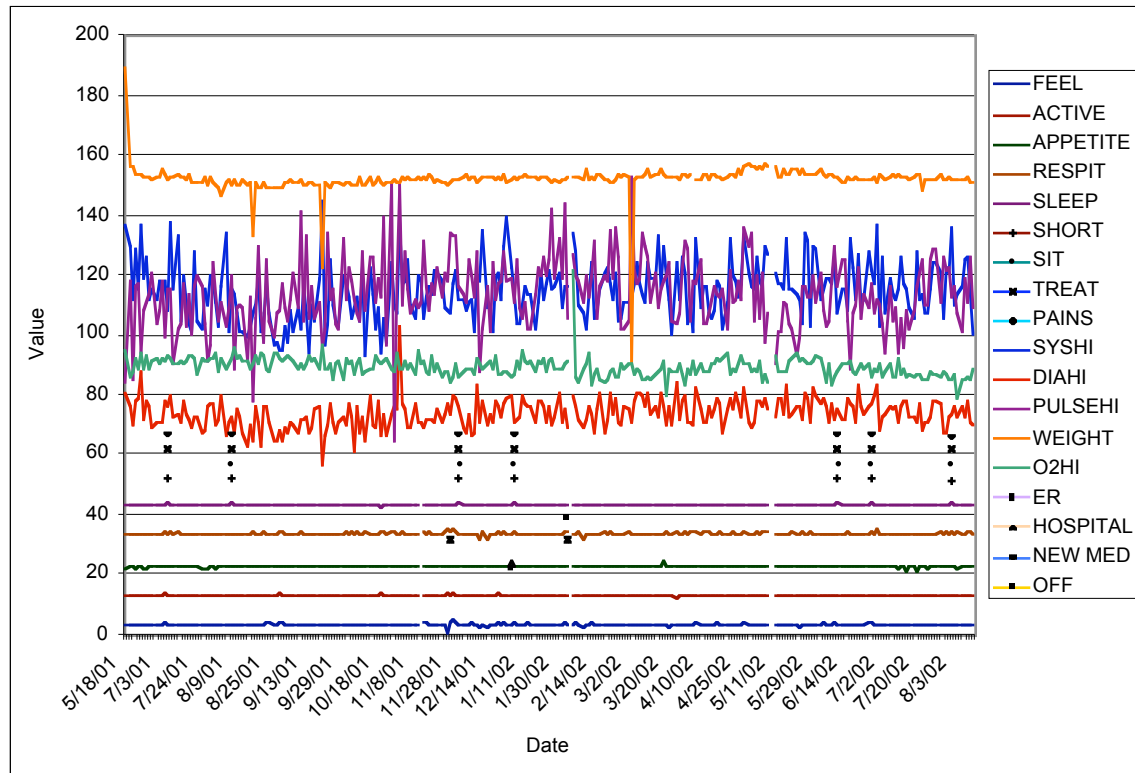


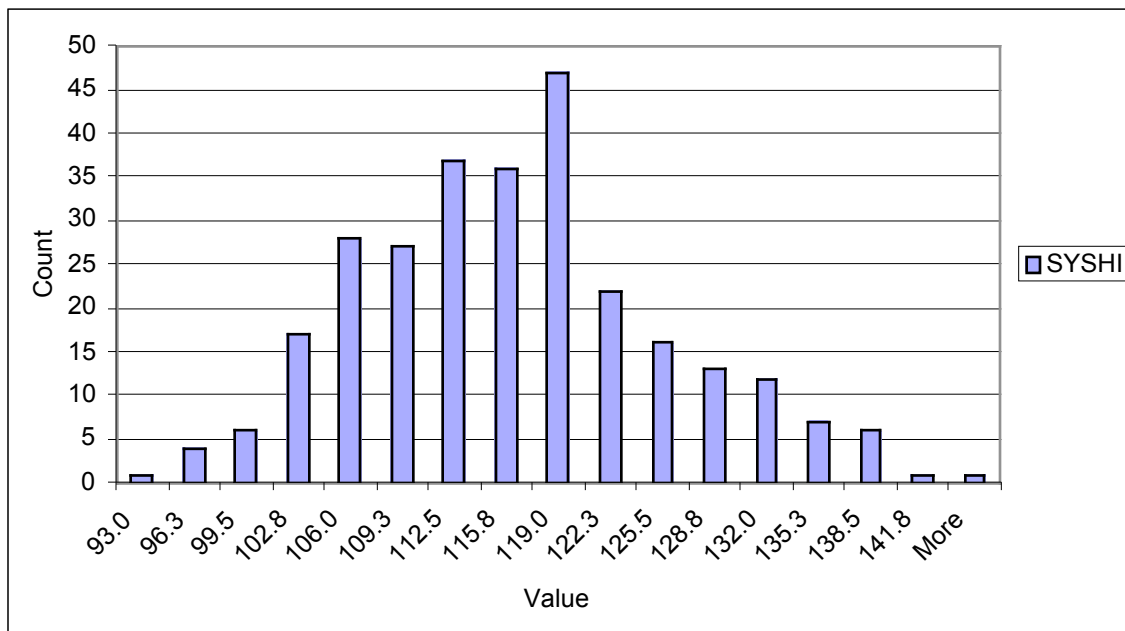
**Graph 1.73 – T13 Composite Data**



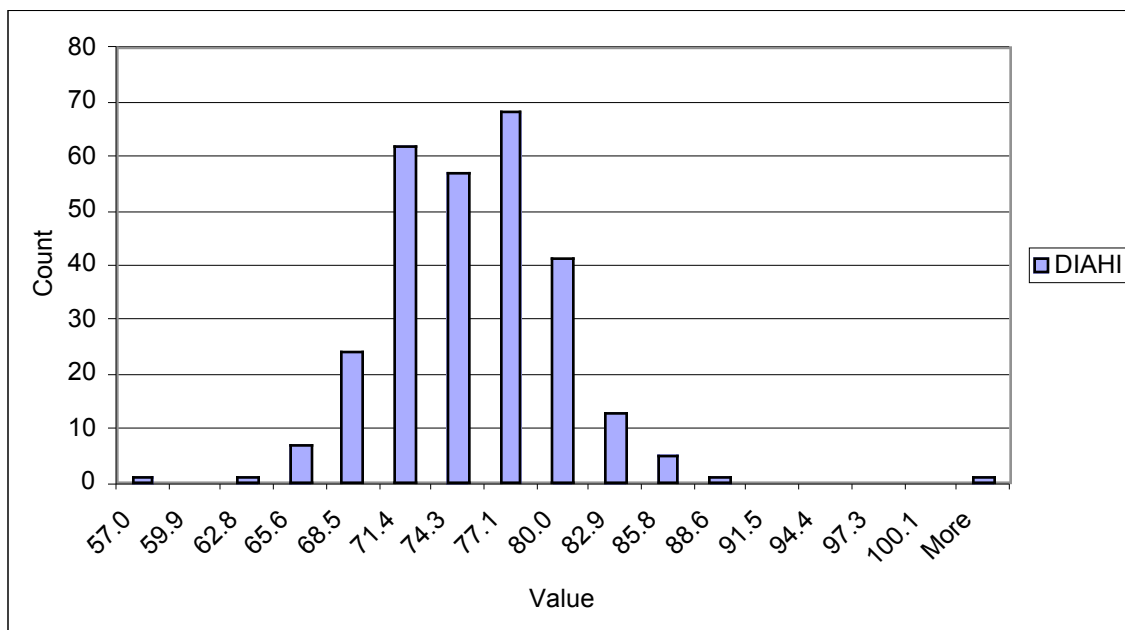
**Table 1.14 – Statistical Measurements for T13**

MEASUREMENT	SYSHI	DIAHI	PULSEHI	WEIGHT	O2HI
Mean	114.8078	73.8968	113.7544	152.1679	89.3345
Standard Error	0.5762	0.2914	0.7138	0.3036	0.1999
Median	115	74	113	153	89
Mode	112	76	116	153	90
Standard Deviation	9.6595	4.8844	11.9657	5.0797	3.3501
Sample Variance	93.3058	23.8572	143.1788	25.8033	11.2234
Kurtosis	-0.0309	4.0442	1.3796	94.0084	31.5181
Skewness	0.3472	0.5667	0.0122	-6.1059	3.1170
Range	52	46	88	99	43
Minimum	93	57	65	90	79
Maximum	145	103	153	189	122

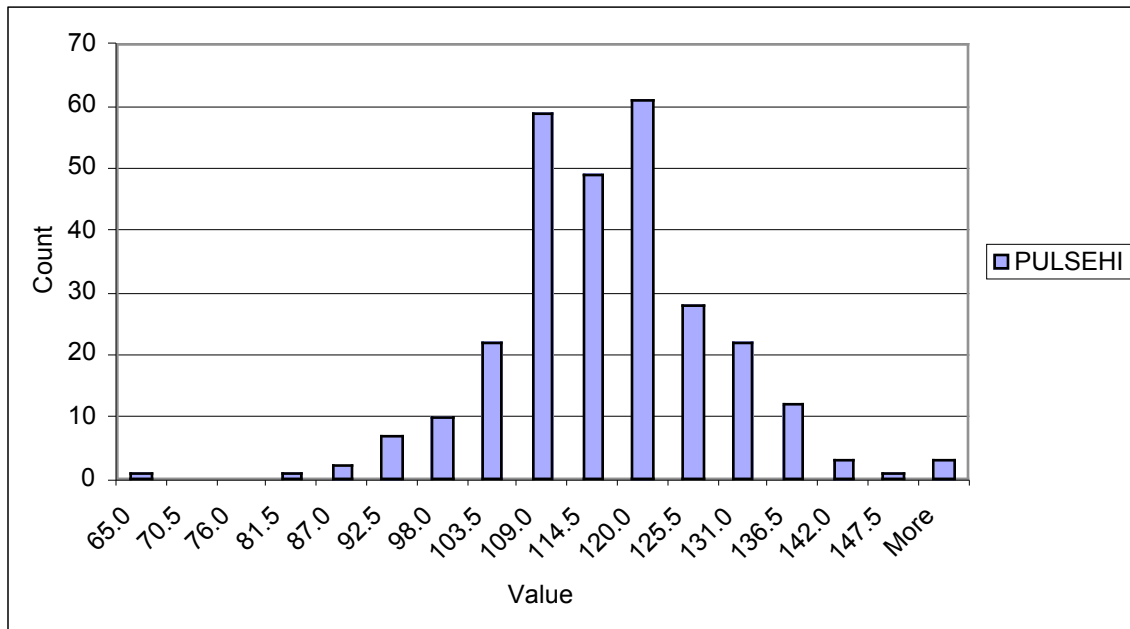
**Graph 1.74 – Distribution of Systolic Readings for T13**



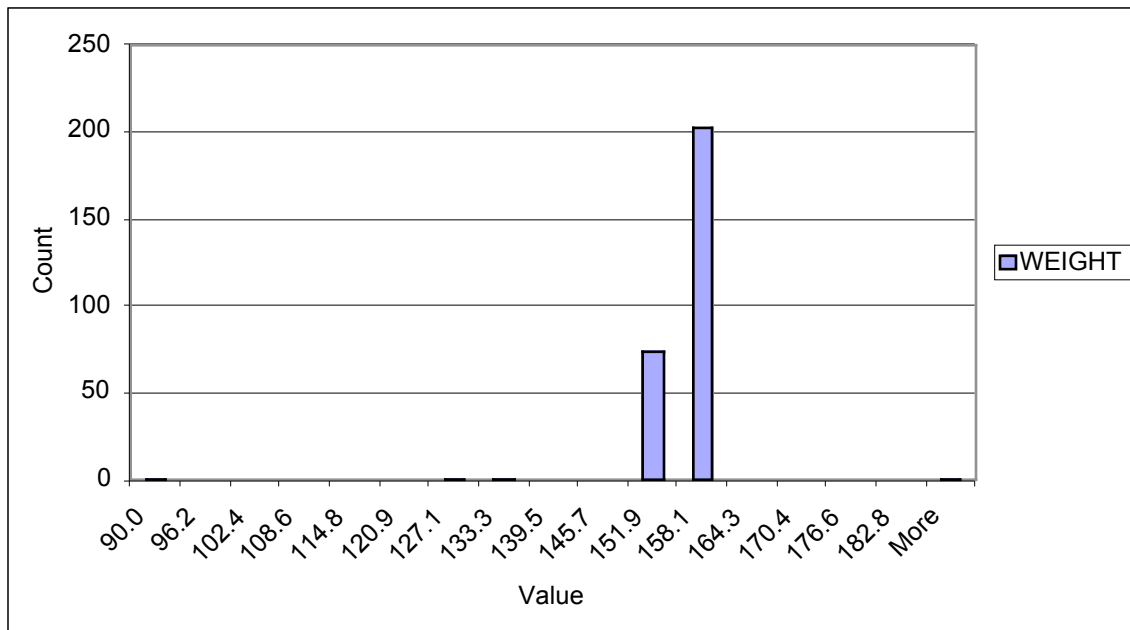
**Graph 1.75 – Distribution of Diastolic Readings for T13**



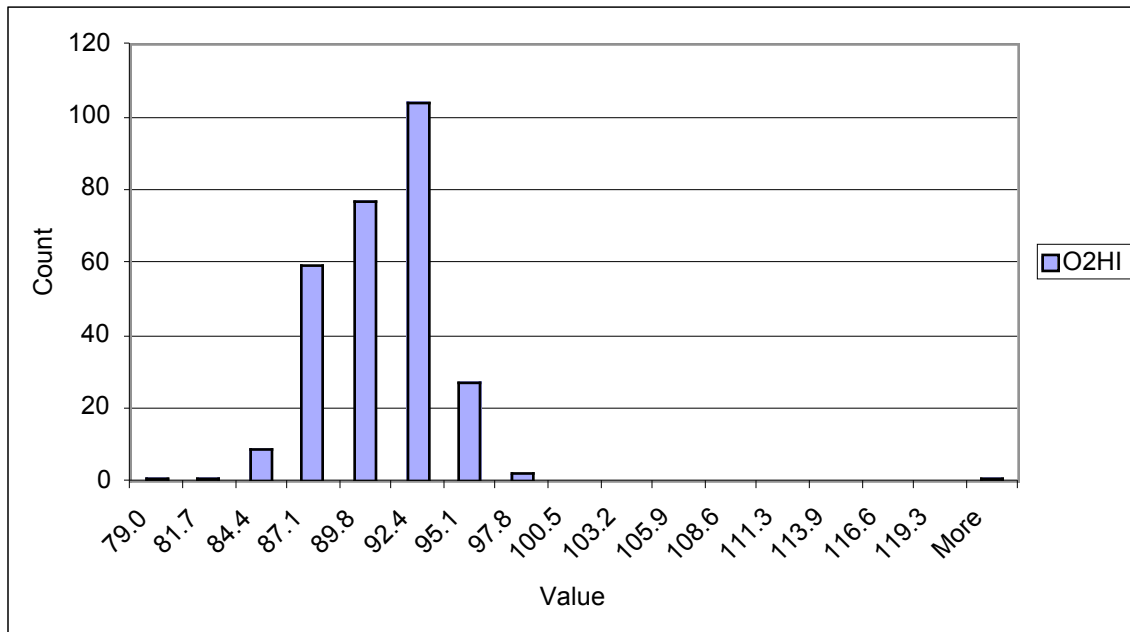
**Graph 1.76 – Distribution of Pulse Readings for T13**



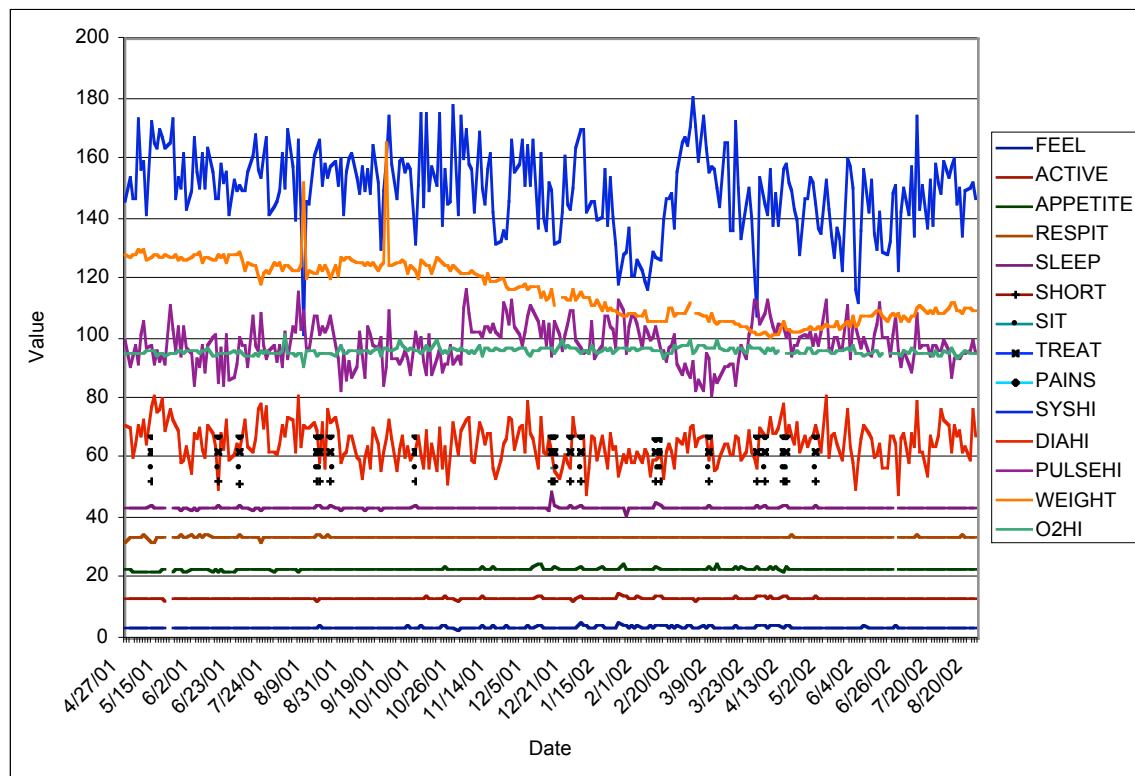
**Graph 1.77 – Distribution of Weight Readings for T13**



**Graph 1.78 – Distribution of O2 Readings for T13**



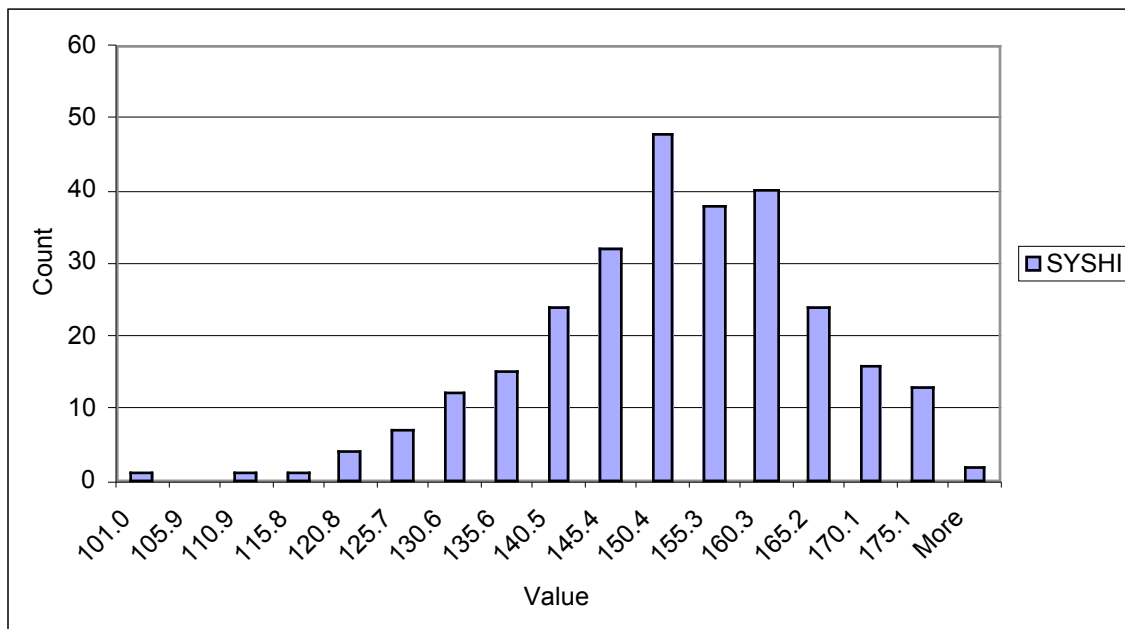
**Graph 1.79 – T14 Composite Data**



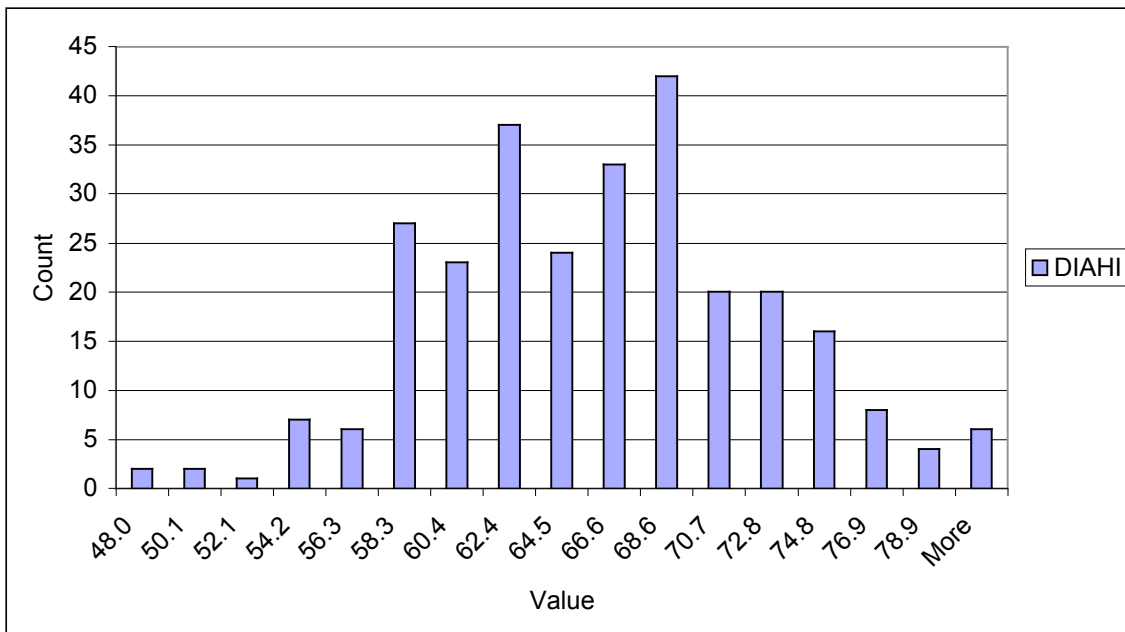
**Table 1.15 – Statistical Measurements for T14**

MEASUREMENT	SYSHI	DIAHI	PULSEHI	WEIGHT	O2HI
Mean	149.2806	64.9604	98.1331	115.7065	95.8804
Standard Error	0.8203	0.3782	0.4176	0.5845	0.0741
Median	150	65	98	115	96
Mode	150	67	98	124	95
Standard Deviation	13.6776	6.3059	6.9630	9.7098	1.2315
Sample Variance	187.0762	39.7638	48.4840	94.2808	1.5166
Kurtosis	0.3146	-0.0936	-0.2766	1.2548	2.1563
Skewness	-0.4402	0.0783	0.0415	0.5932	0.1237
Range	79	33	35	65	11
Minimum	101	48	81	100	90
Maximum	180	81	116	165	101

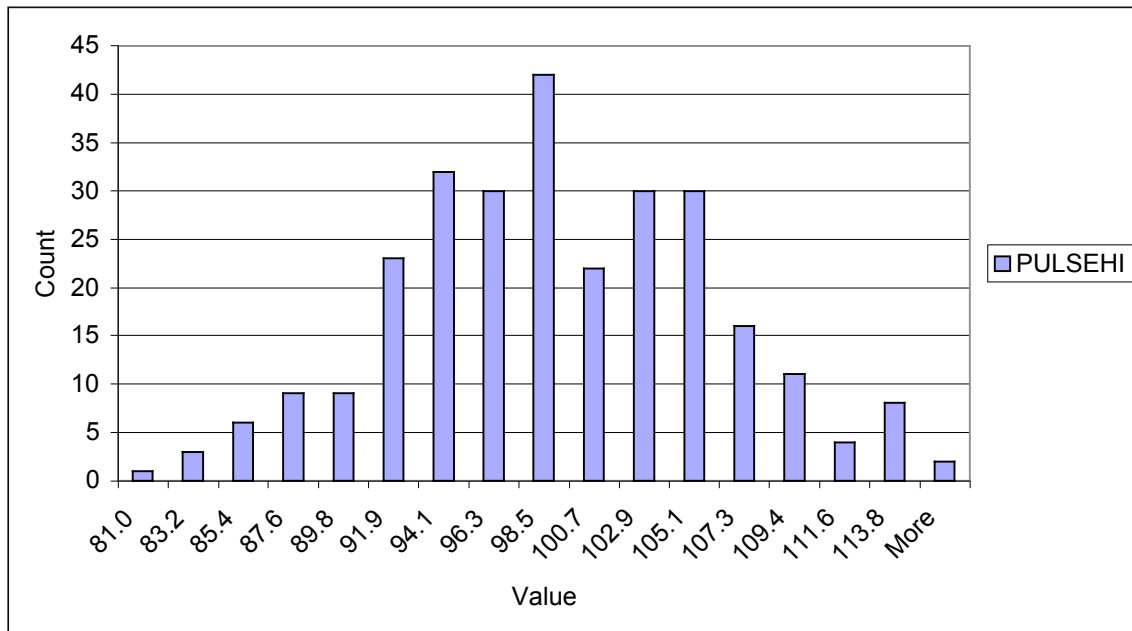
**Graph 1.80 – Distribution of Systolic Readings for T14**



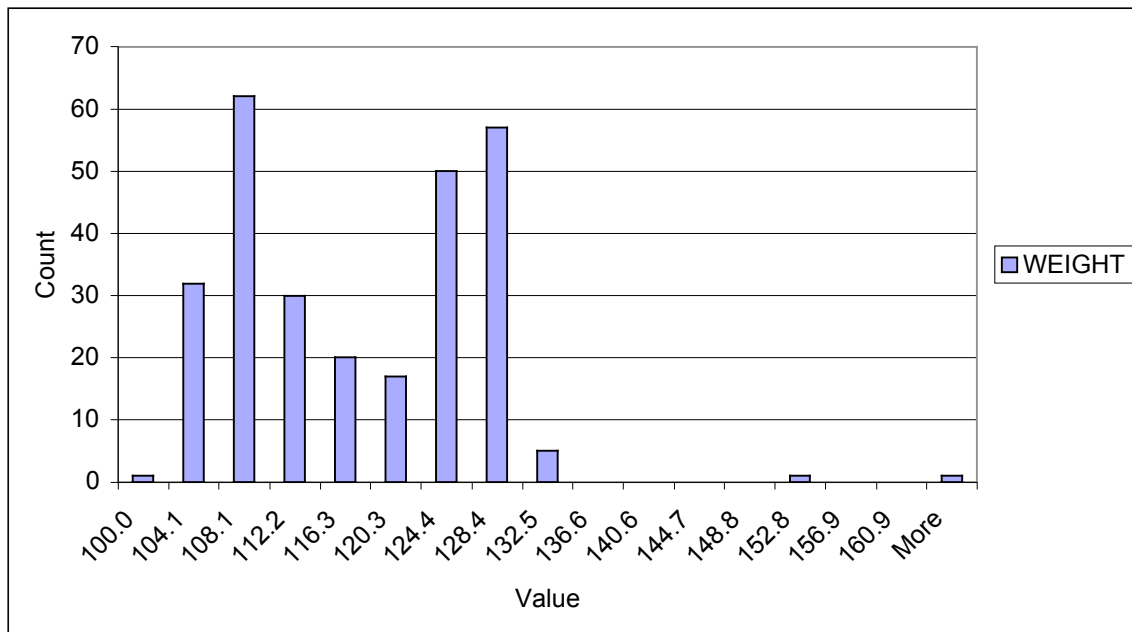
**Graph 1.81 – Distribution of Diastolic Readings for T14**



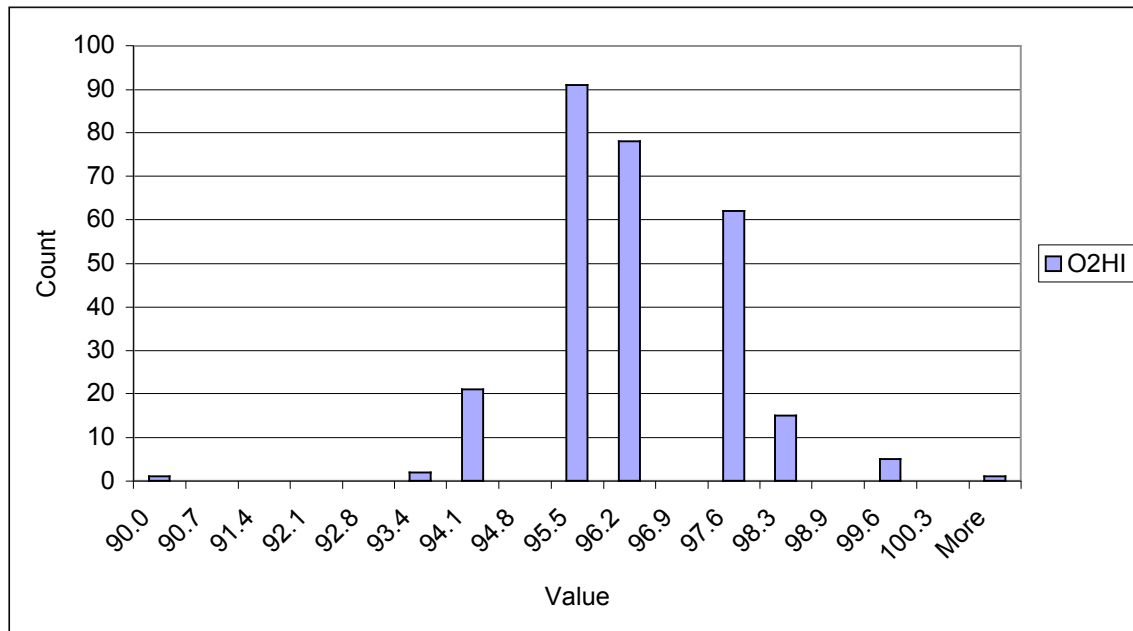
**Graph 1.82 – Distribution of Pulse Readings for T14**



**Graph 1.83 – Distribution of Weight Readings for T14**

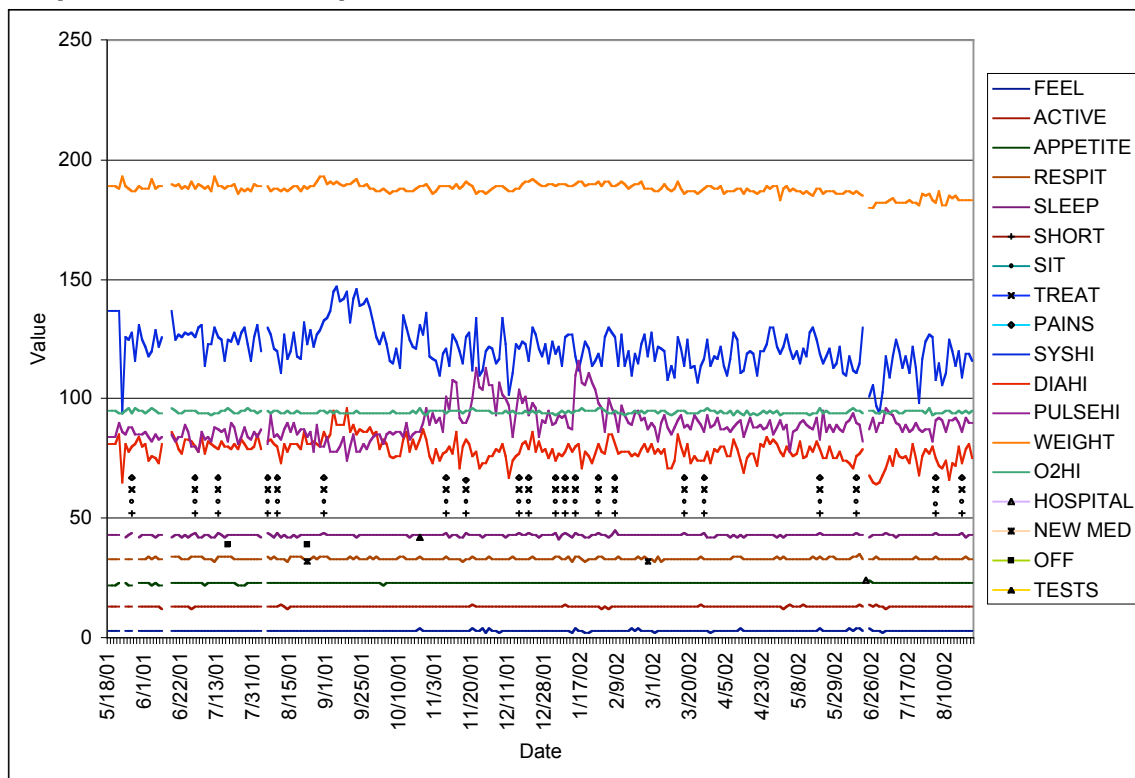


**Graph 1.84 – Distribution of O2 Readings for T14**





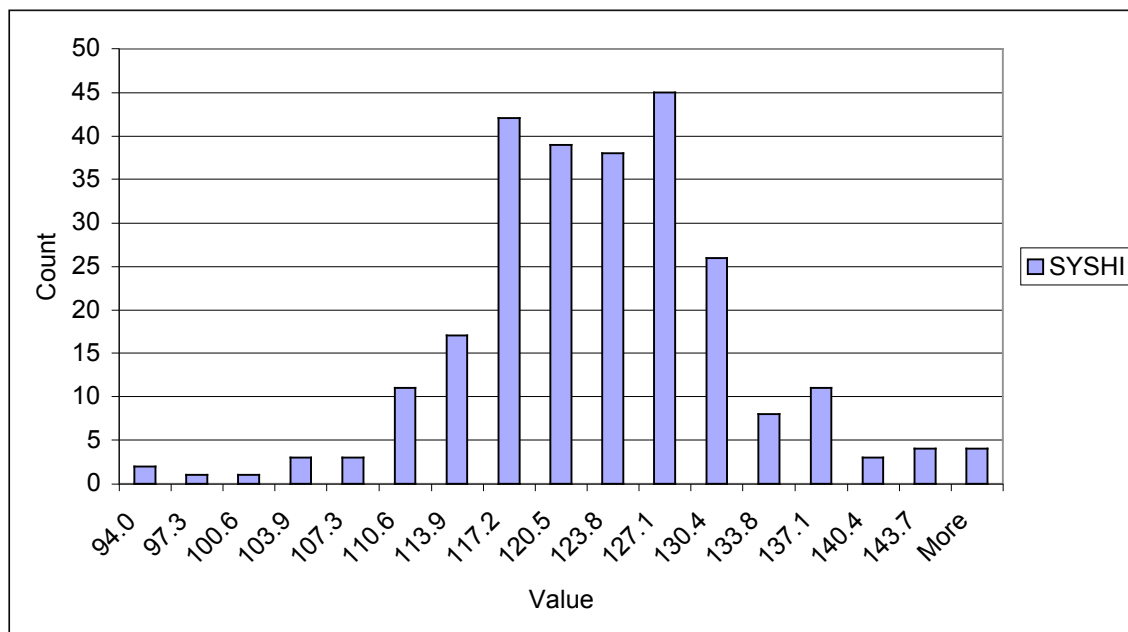
**Graph 1.85 – T15 Composite Data**



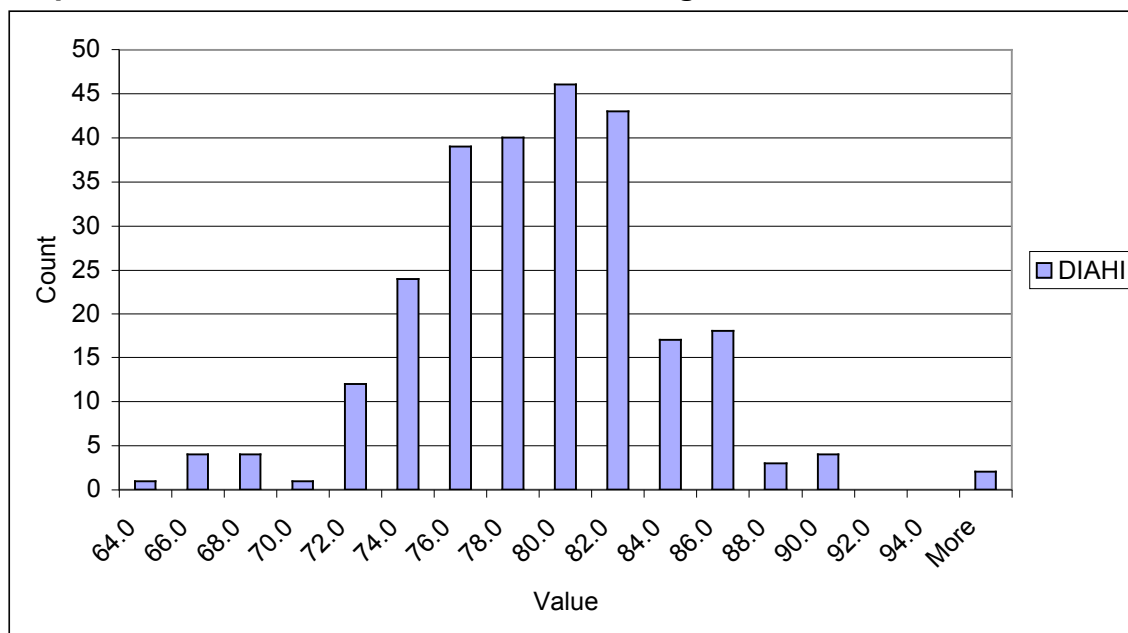
**Table 1.16 – Statistical Measurements for T15**

MEASUREMENT	SYSHI	DIAHI	PULSEHI	WEIGHT	O2HI
Mean	121.5581	78.4845	89.2093	187.7597	94.4767
Standard Error	0.5501	0.2999	0.4271	0.1534	0.0423
Median	121	79	88	188	94
Mode	120	81	86	189	94
Standard Deviation	8.8352	4.8167	6.8595	2.4646	0.6786
Sample Variance	78.0608	23.2001	47.0533	6.0743	0.4605
Kurtosis	0.8354	1.2124	2.3547	1.0538	-0.1771
Skewness	0.0655	-0.0279	1.2898	-0.9039	0.1978
Range	53	32	42	13	3
Minimum	94	64	74	180	93
Maximum	147	96	116	193	96

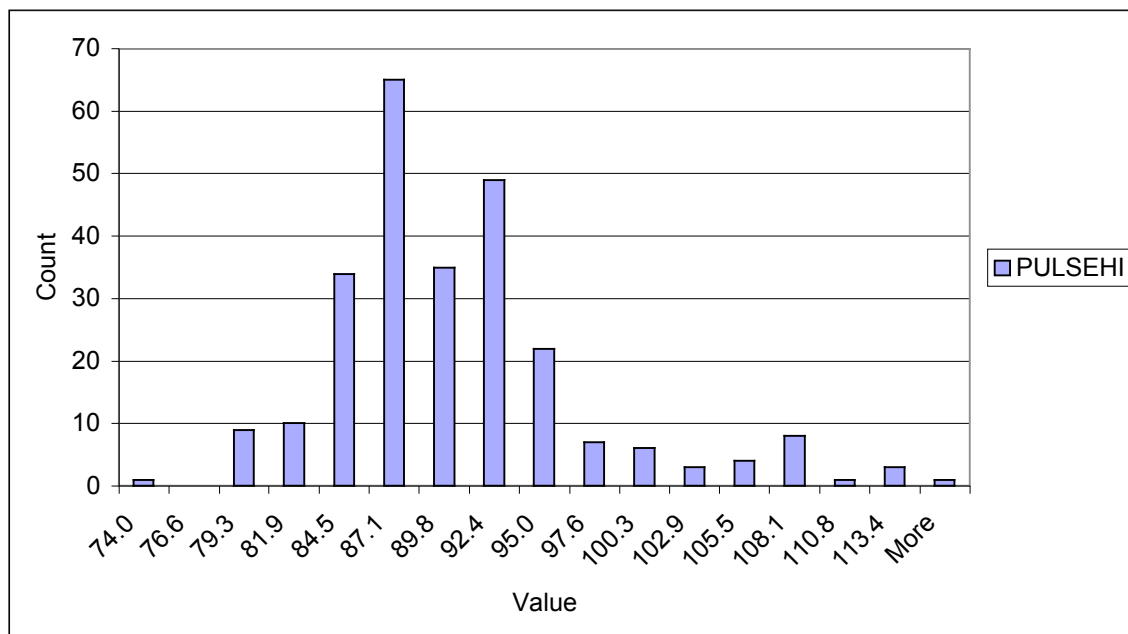
**Graph 1.86 – Distribution of Systolic Readings for T15**



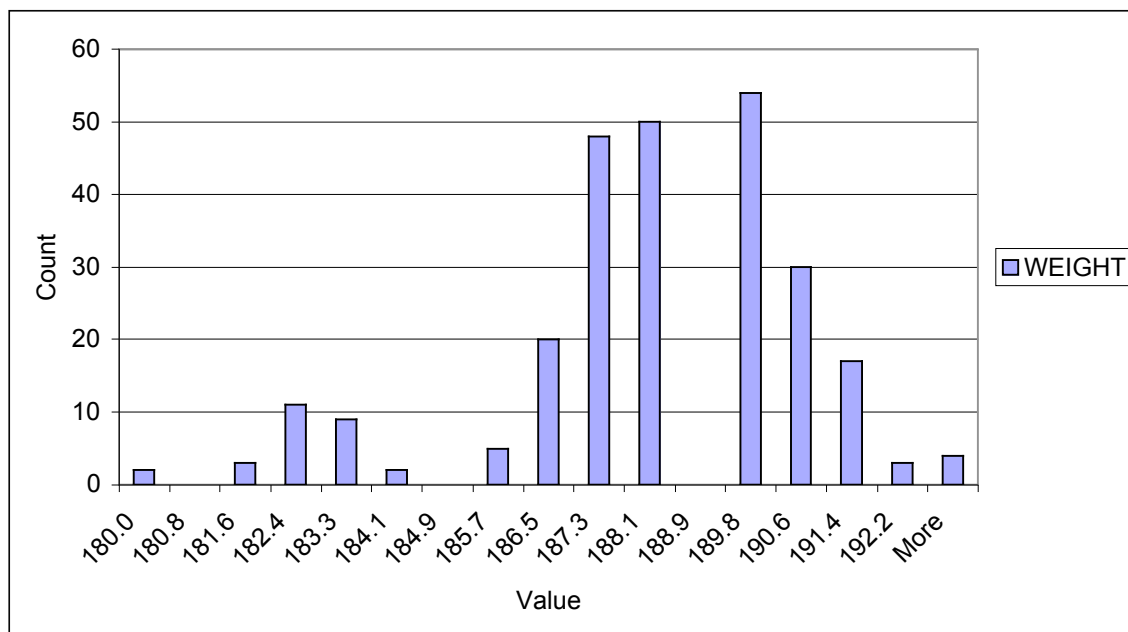
**Graph 1.87 – Distribution of Diastolic Readings for T15**



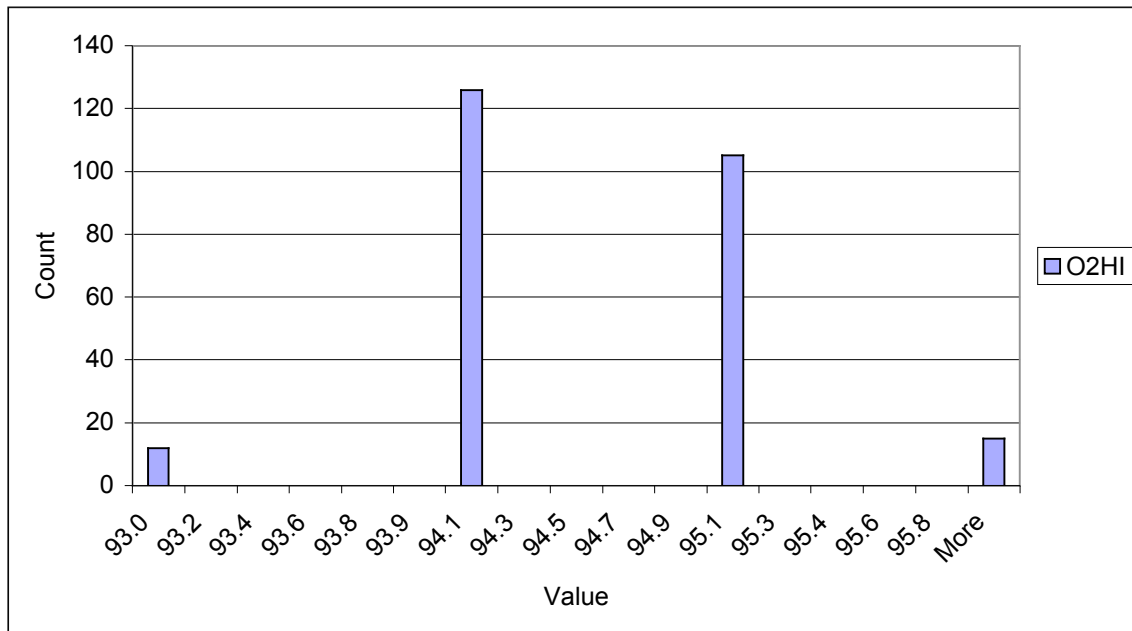
**Graph 1.88 – Distribution of Pulse Readings for T15**



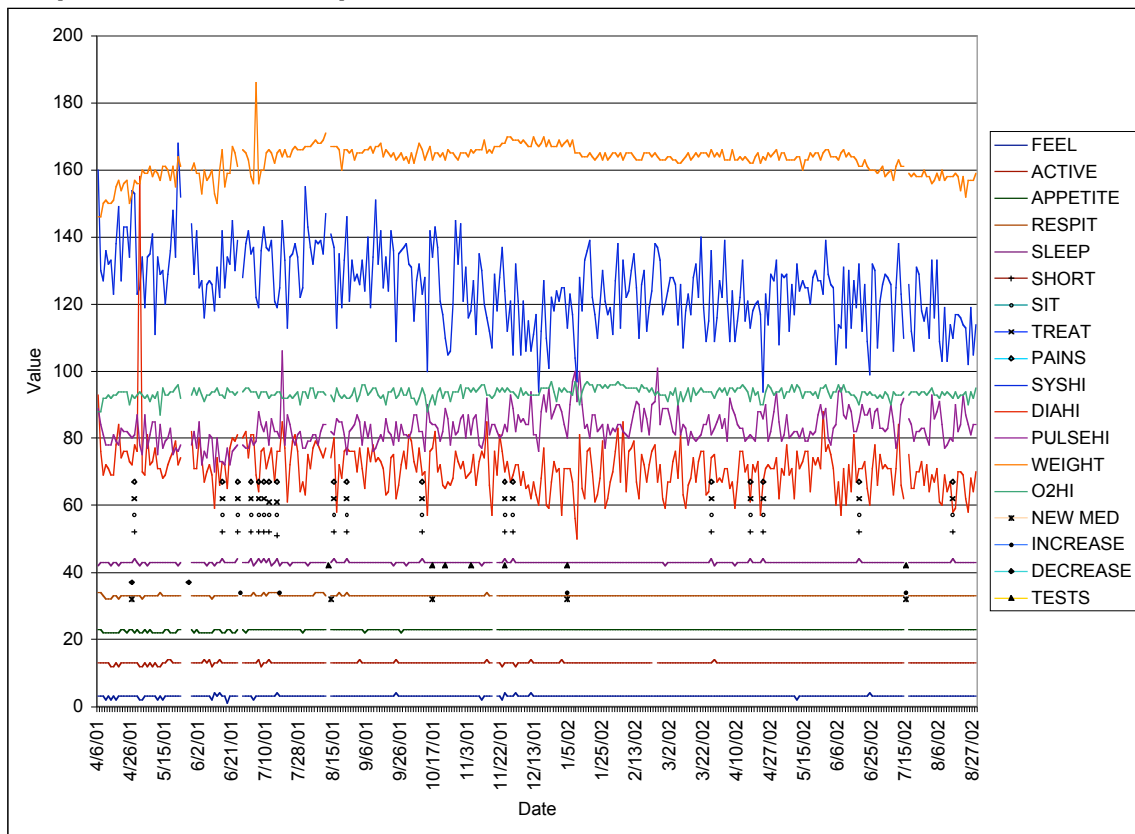
**Graph 1.89 – Distribution of Weight Readings for T15**



**Graph 1.90 – Distribution of O2 Readings for T15**



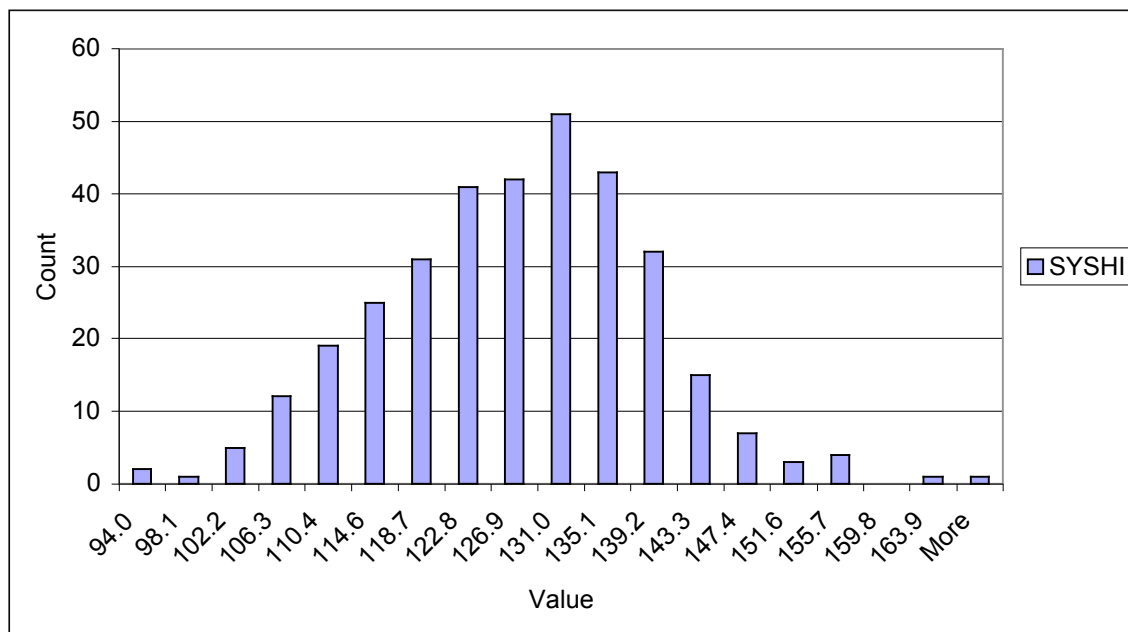
**Graph 1.91 – T16 Composite Data**



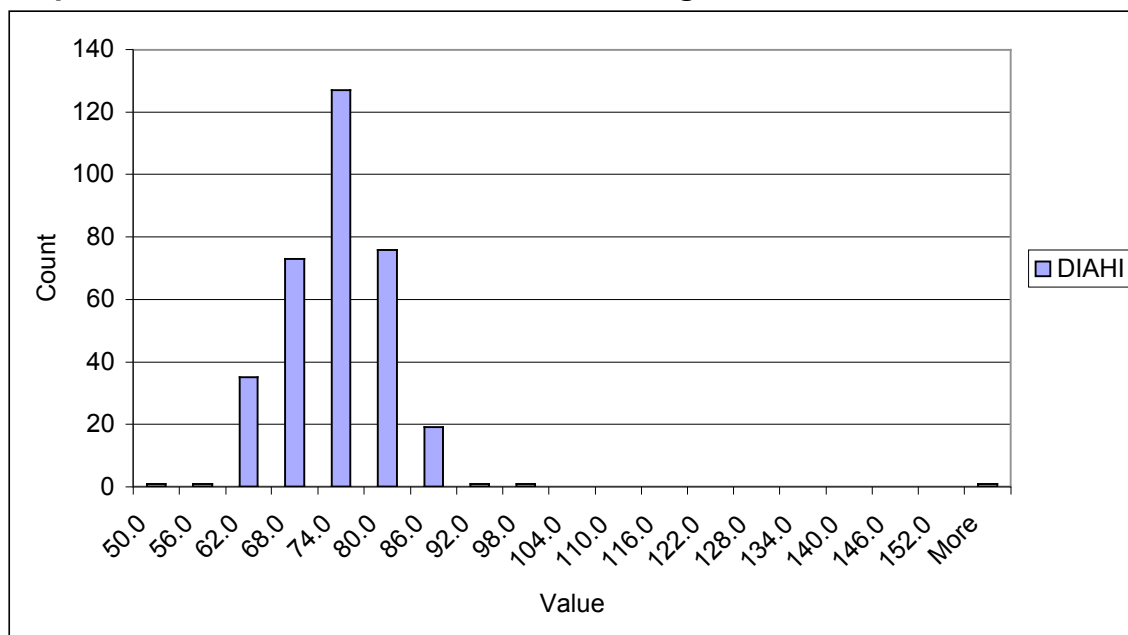
**Table 1.17 – Statistical Measurements for T16**

MEASUREMENT	SYSHI	DIAHI	PULSEHI	WEIGHT	O2HI
Mean	125.2299	71.1284	83.2149	162.9642	93.5881
Standard Error	0.6440	0.4325	0.2730	0.2409	0.0860
Median	126	71	82	164	94
Mode	127	76	82	165	94
Standard Deviation	11.7872	7.9164	4.9972	4.4086	1.5737
Sample Variance	138.9380	62.6691	24.9716	19.4358	2.4765
Kurtosis	0.1830	42.5142	1.6651	3.3434	1.5437
Skewness	0.0895	3.8578	0.7431	-0.6445	-0.8010
Range	74	108	36	40	10
Minimum	94	50	70	146	87
Maximum	168	158	106	186	97

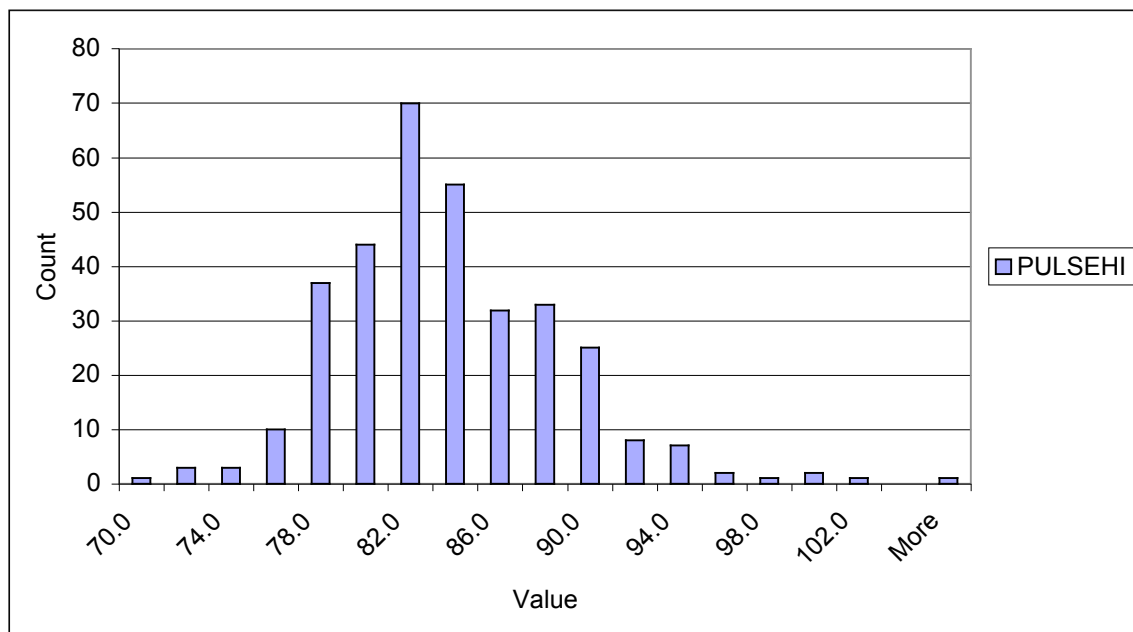
**Graph 1.92 – Distribution of Systolic Readings for T16**



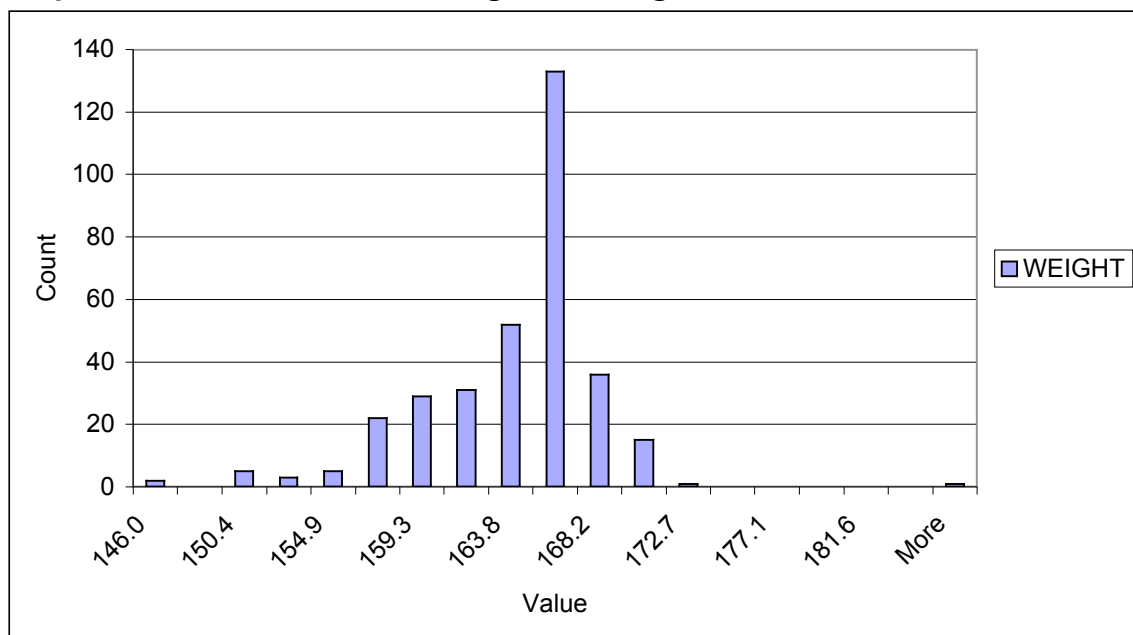
**Graph 1.93 – Distribution of Diastolic Readings for T16**



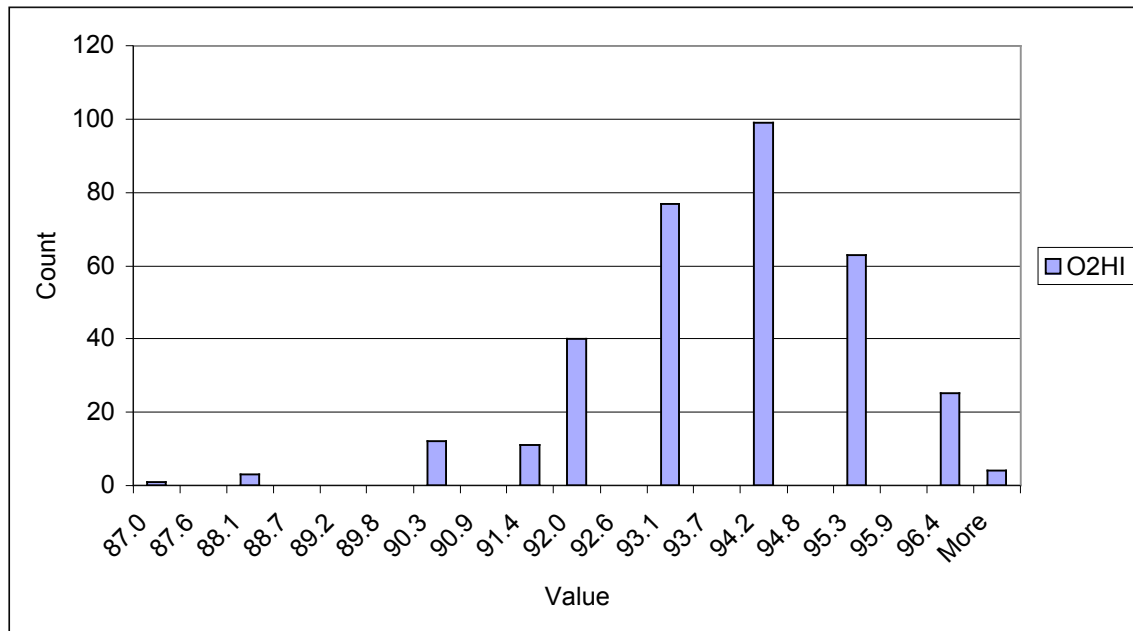
**Graph 1.94 – Distribution of Pulse Readings for T16**



**Graph 1.95 – Distribution of Weight Readings for T16**

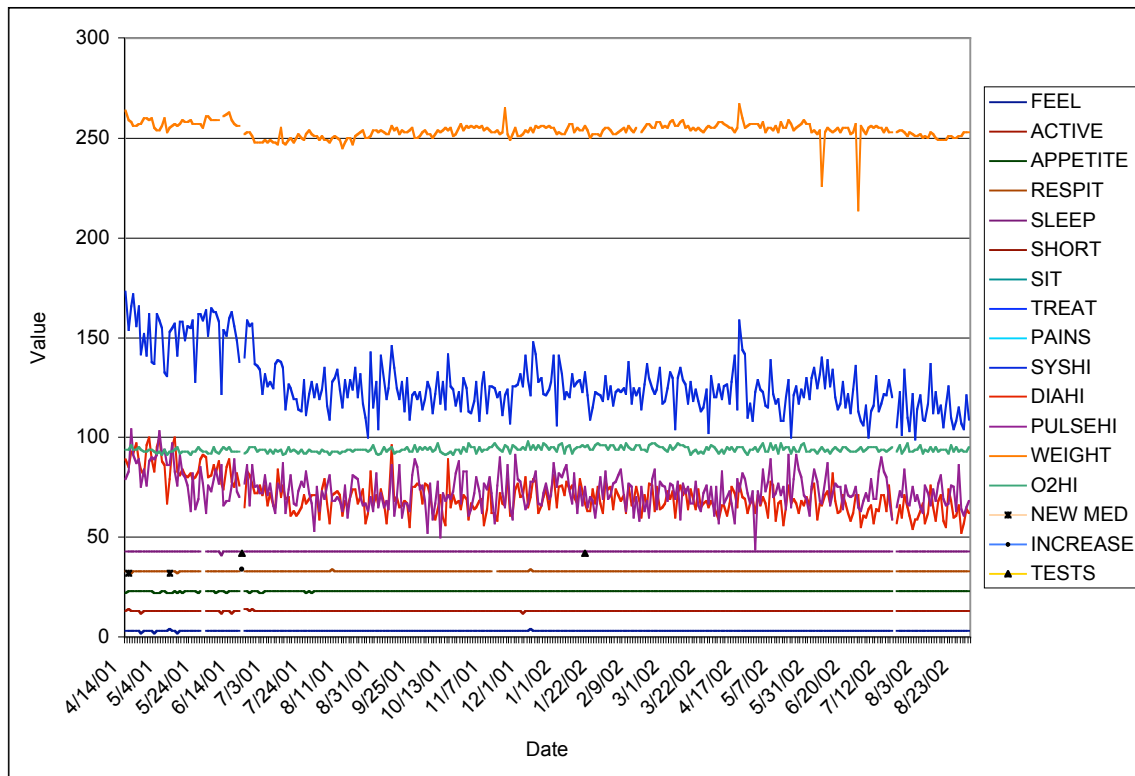


**Graph 1.96 – Distribution of O2 Readings for T16**





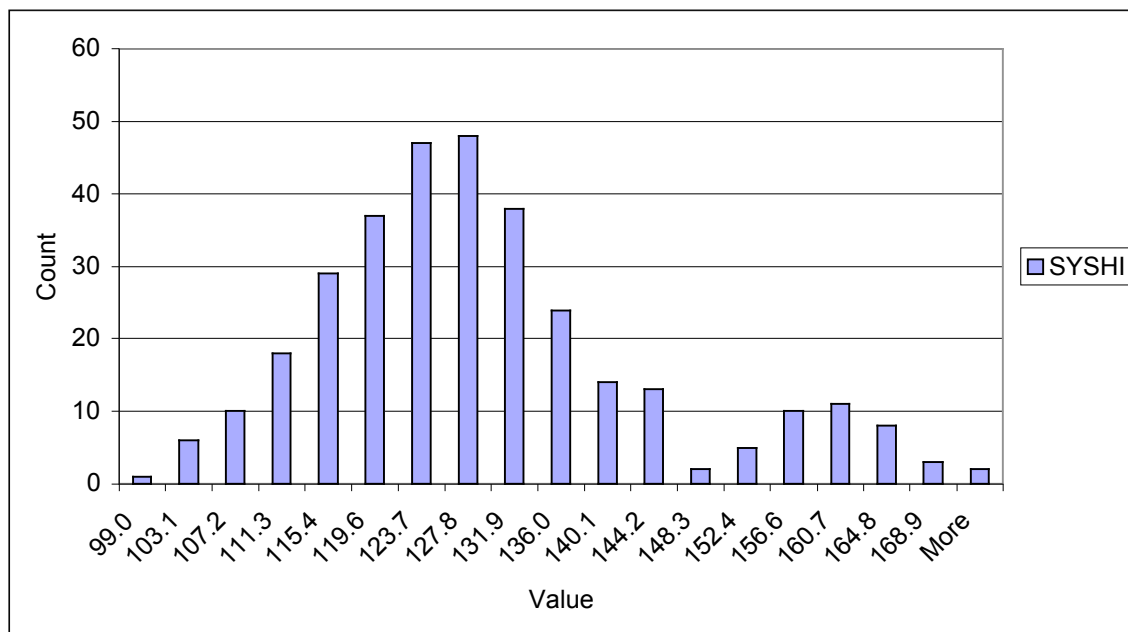
**Graph 1.97 – T17 Composite Data**



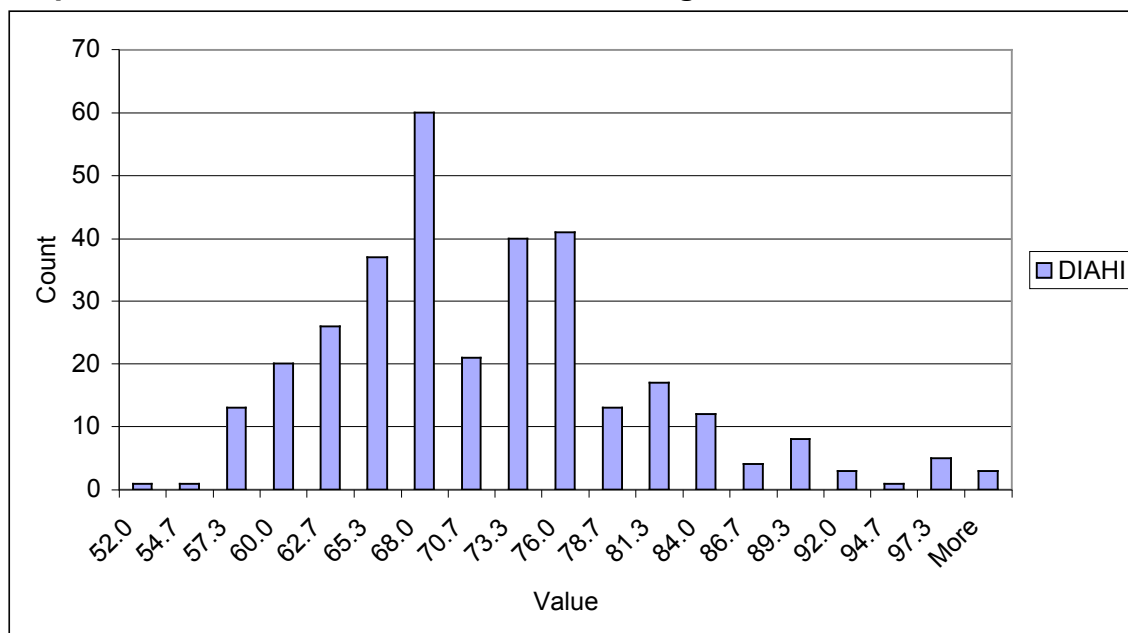
**Table 1.18 – Statistical Measurements for T17**

MEASUREMENT	SYSHI	DIAHI	PULSEHI	WEIGHT	O2HI
Mean	127.1902	70.4509	73.5031	253.8117	93.9939
Standard Error	0.8281	0.4971	0.4937	0.2335	0.0784
Median	125	69	73	254	94
Mode	128	67	75	255	94
Standard Deviation	14.9512	8.9753	8.9135	4.2036	1.4164
Sample Variance	223.5391	80.5560	79.4508	17.6703	2.0061
Kurtosis	0.4962	0.8487	0.3113	29.7767	-0.3021
Skewness	0.8767	0.8487	0.2521	-3.3257	0.1874
Range	74	48	60	53	7
Minimum	99	52	44	214	91
Maximum	173	100	104	267	98

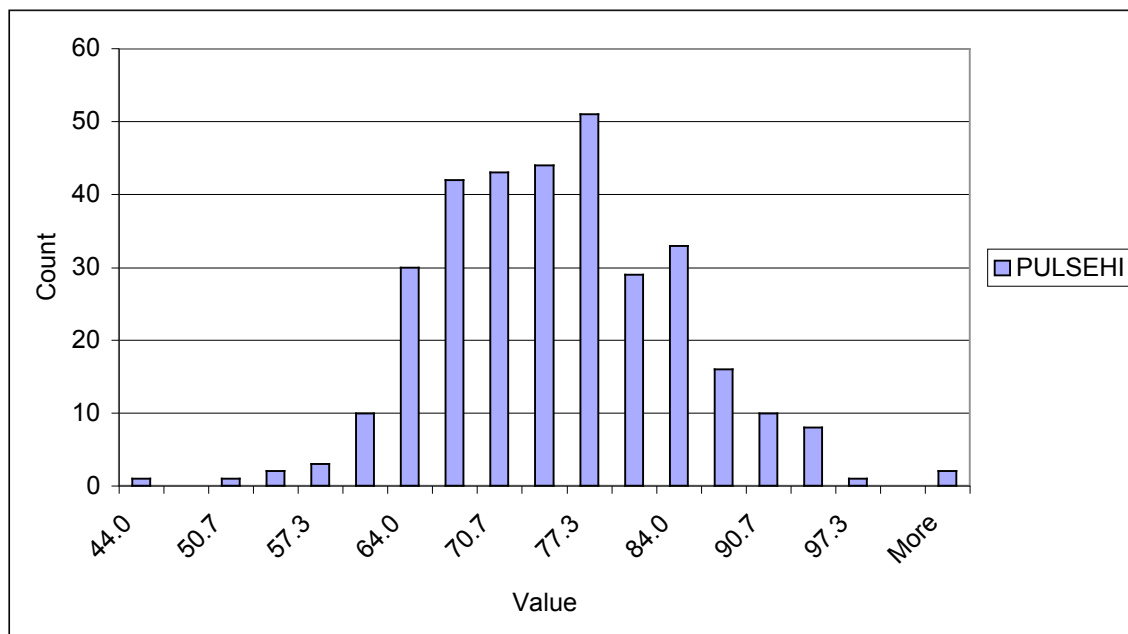
**Graph 1.98 – Distribution of Systolic Readings for T17**



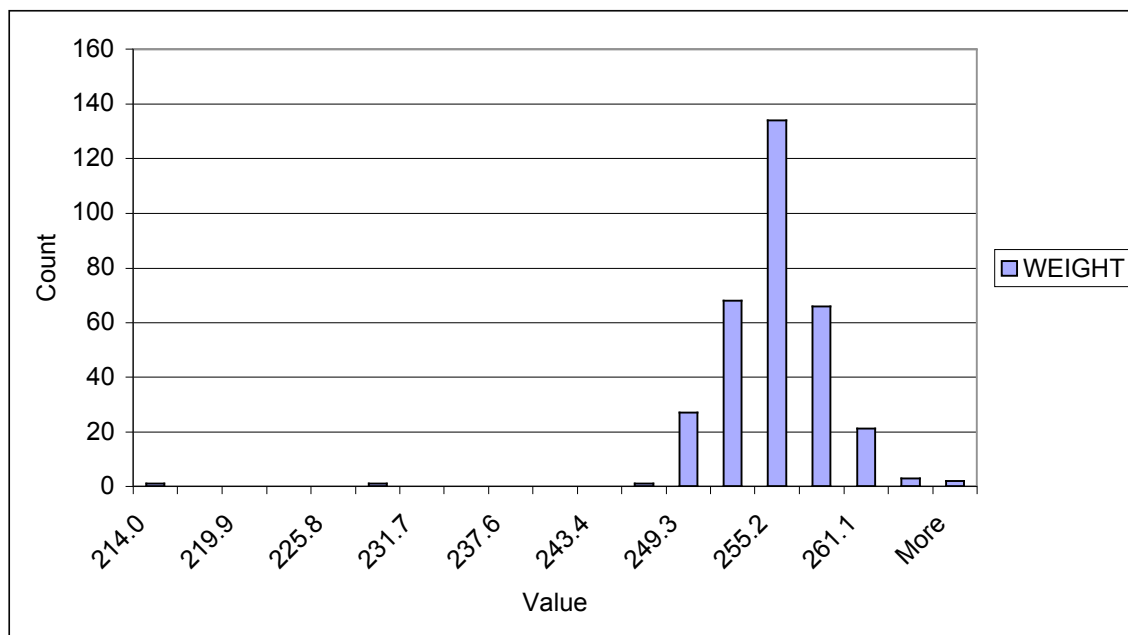
**Graph 1.99 – Distribution of Diastolic Readings for T17**



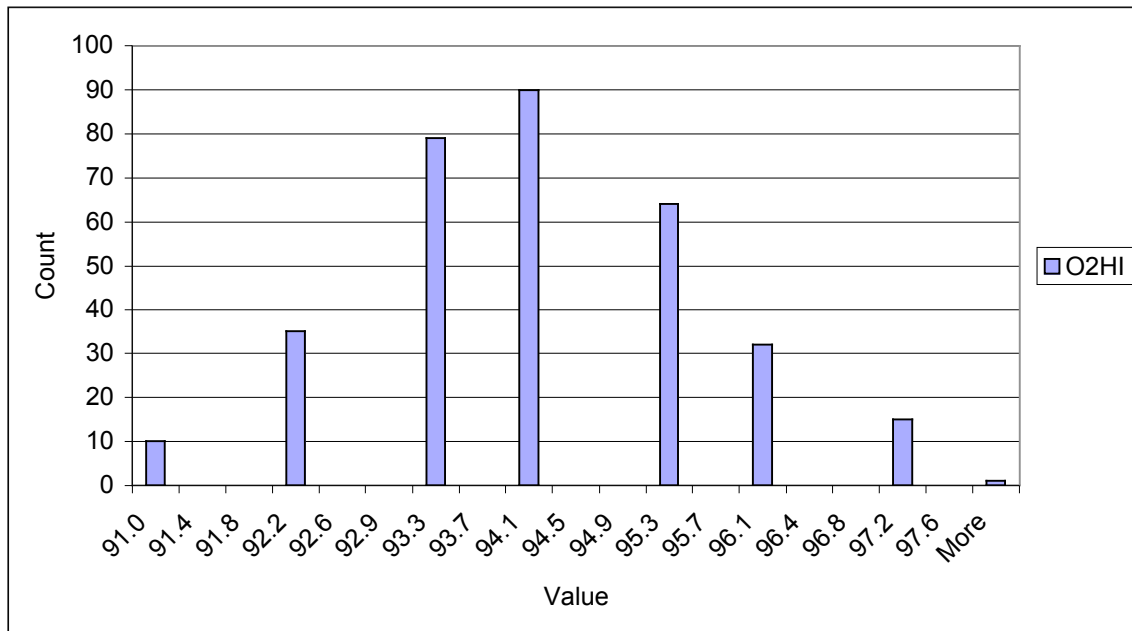
**Graph 1.100 – Distribution of Pulse Readings for T17**



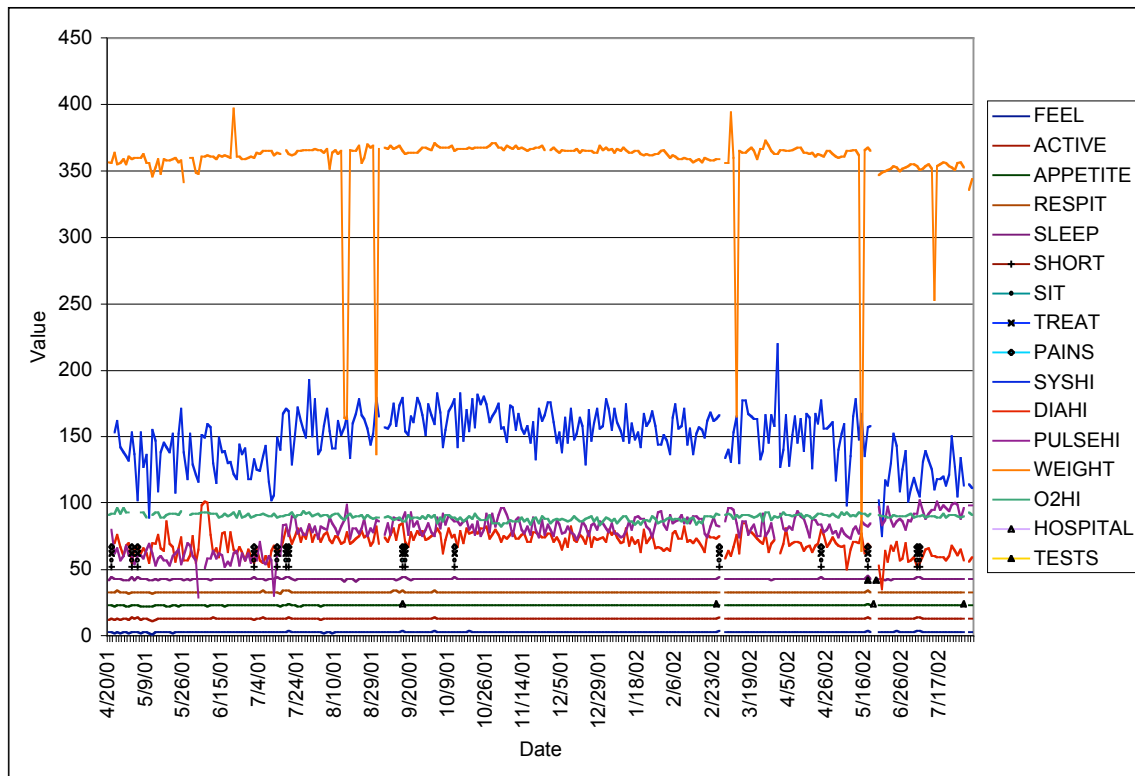
**Graph 1.101 – Distribution of Weight Readings for T17**



**Graph 1.102 – Distribution of O2 Readings for T17**



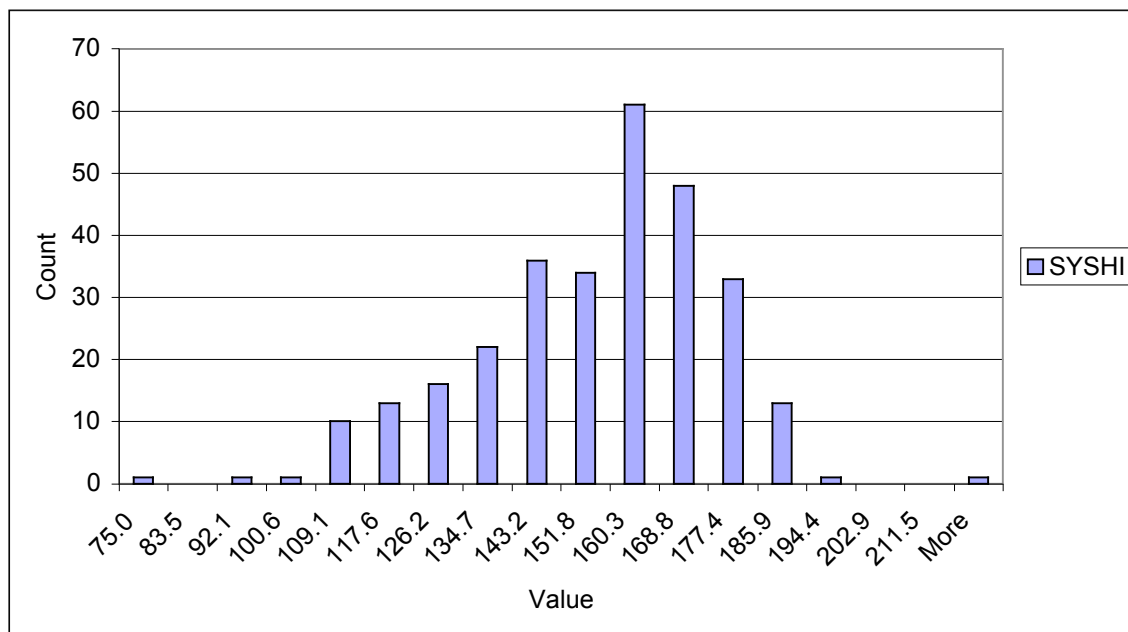
**Graph 1.103 – T18 Composite Data**



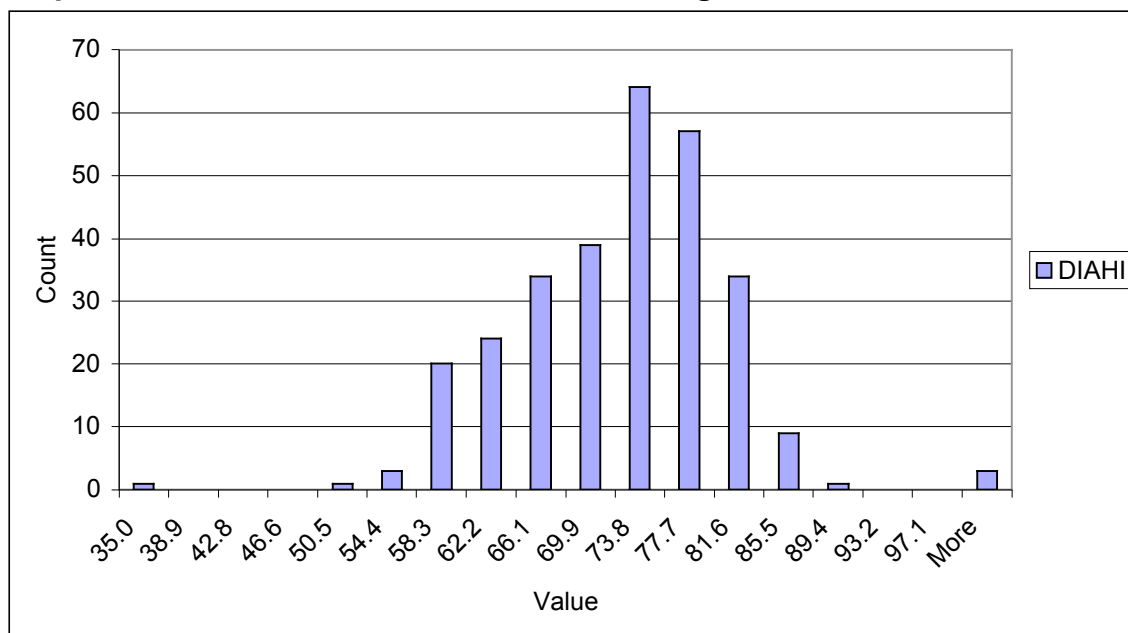
**Table 1.19 – Statistical Measurements for T18**

MEASUREMENT	SYSHI	DIAHI	PULSEHI	WEIGHT	O2HI
Mean	149.2887	70.2586	79.1793	358.2828	89.5208
Standard Error	1.2141	0.4801	0.7179	1.8154	0.1403
Median	153	71	81.5	364	90
Mode	158	71	80	365	91
Standard Deviation	20.7115	8.1753	12.2249	30.9158	2.3801
Sample Variance	428.9647	66.8360	149.4487	955.7883	5.6651
Kurtosis	0.4097	1.7266	1.0900	52.2710	-0.0310
Skewness	-0.5466	-0.1097	-0.9573	-6.9947	-0.3984
Range	145	66	73	333	14
Minimum	75	35	29	64	82
Maximum	220	101	102	397	96

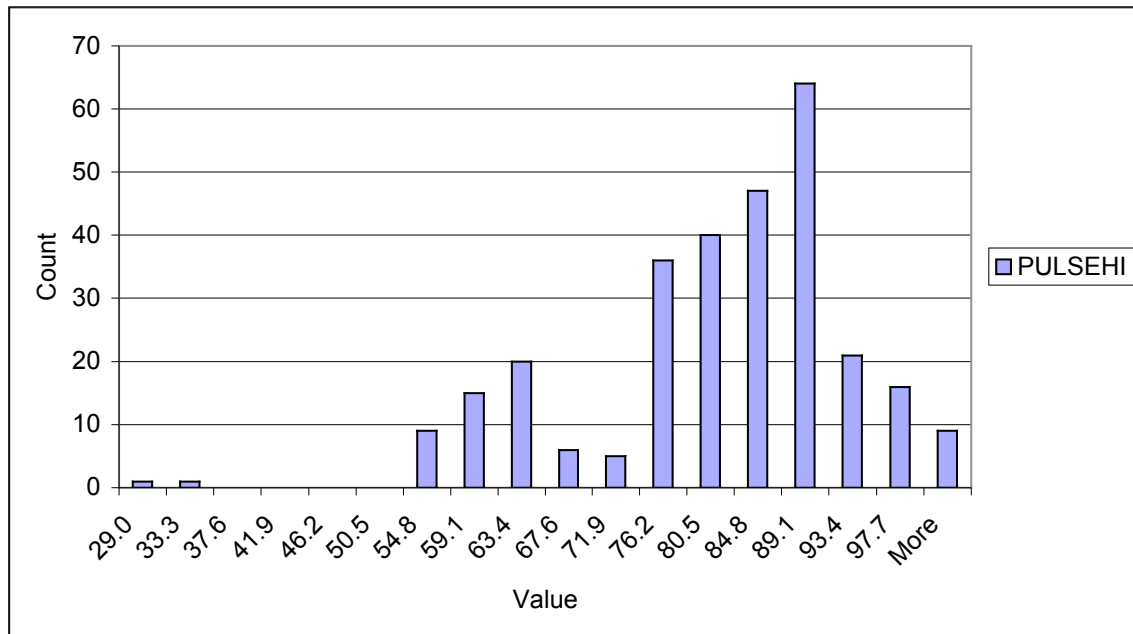
**Graph 1.104 – Distribution of Systolic Readings for T18**



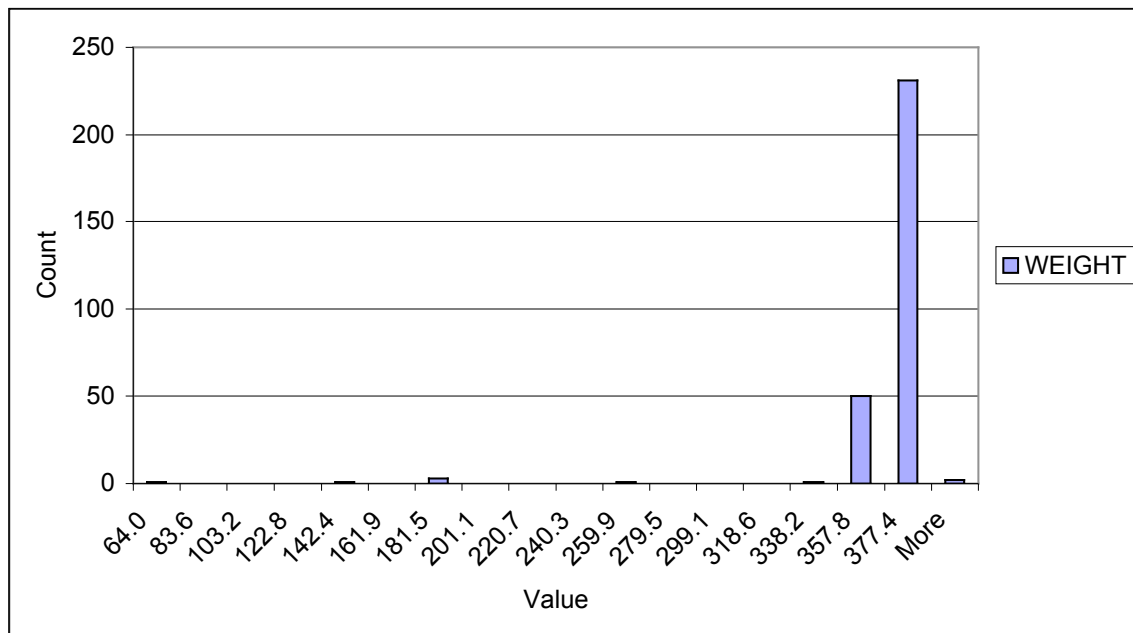
**Graph 1.105 – Distribution of Diastolic Readings for T18**



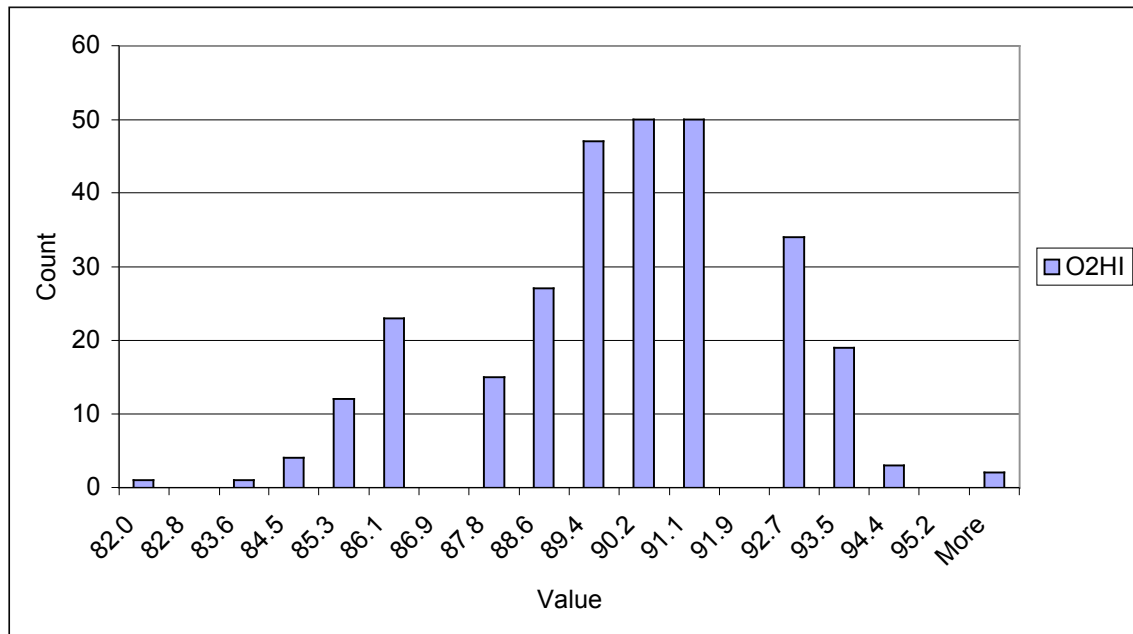
**Graph 1.106 – Distribution of Pulse Readings for T18**



**Graph 1.107 – Distribution of Weight Readings for T18**

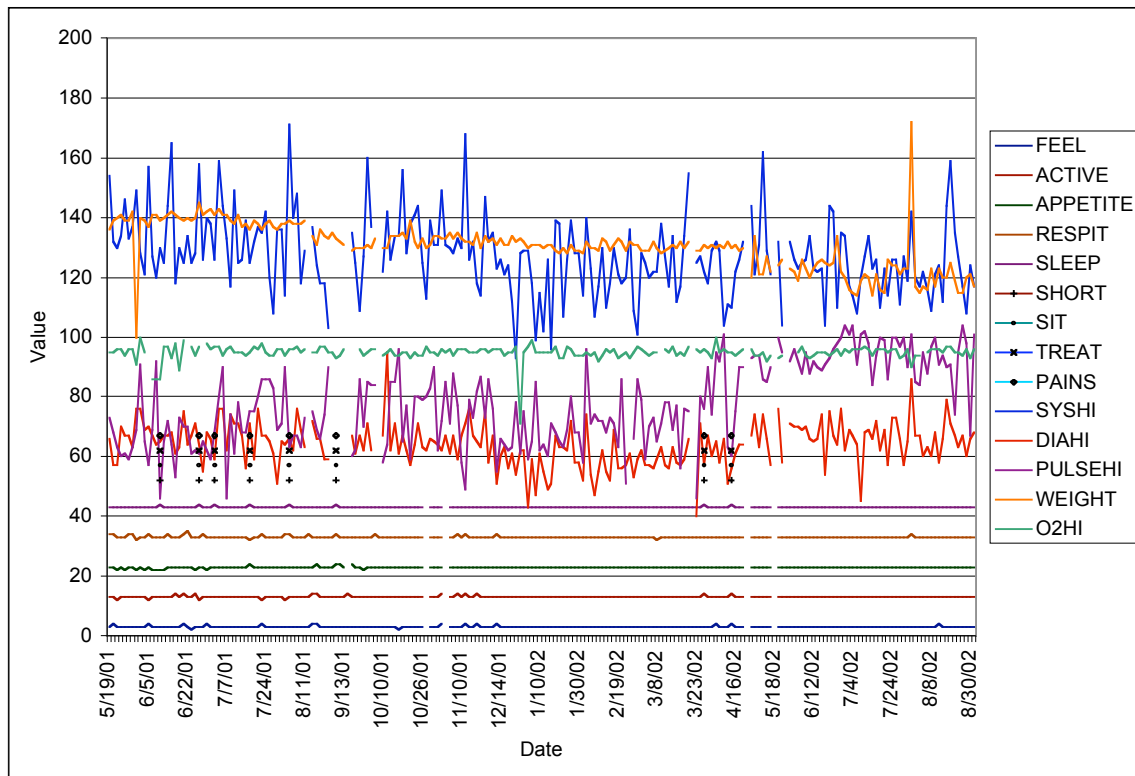


**Graph 1.108 – Distribution of O2 Readings for T18**





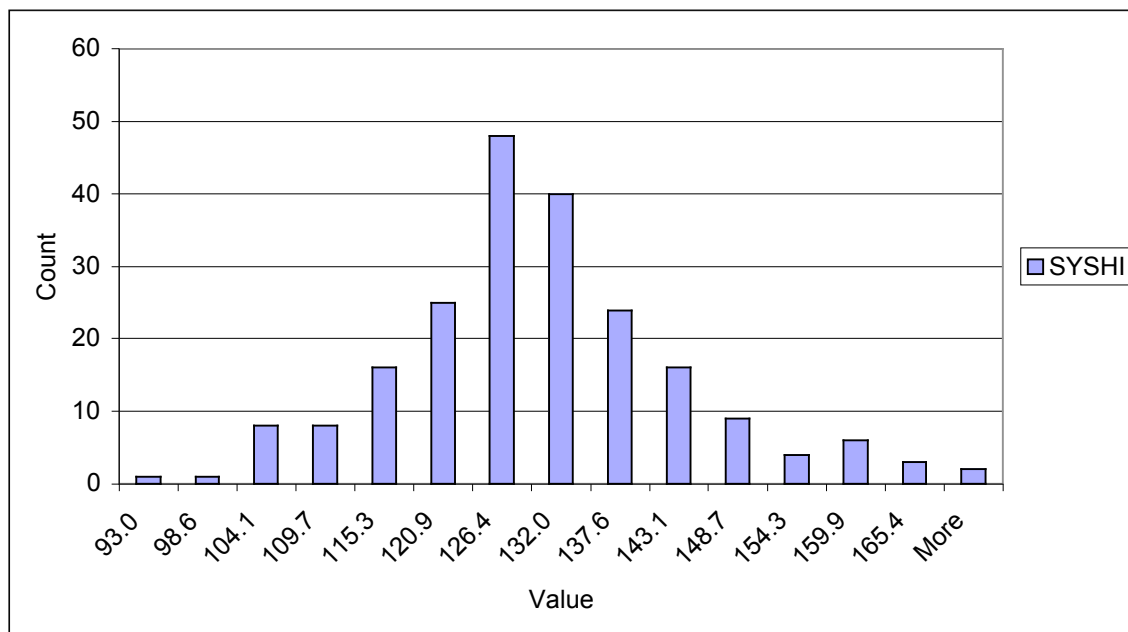
**Graph 1.109 – T19 Composite Data**



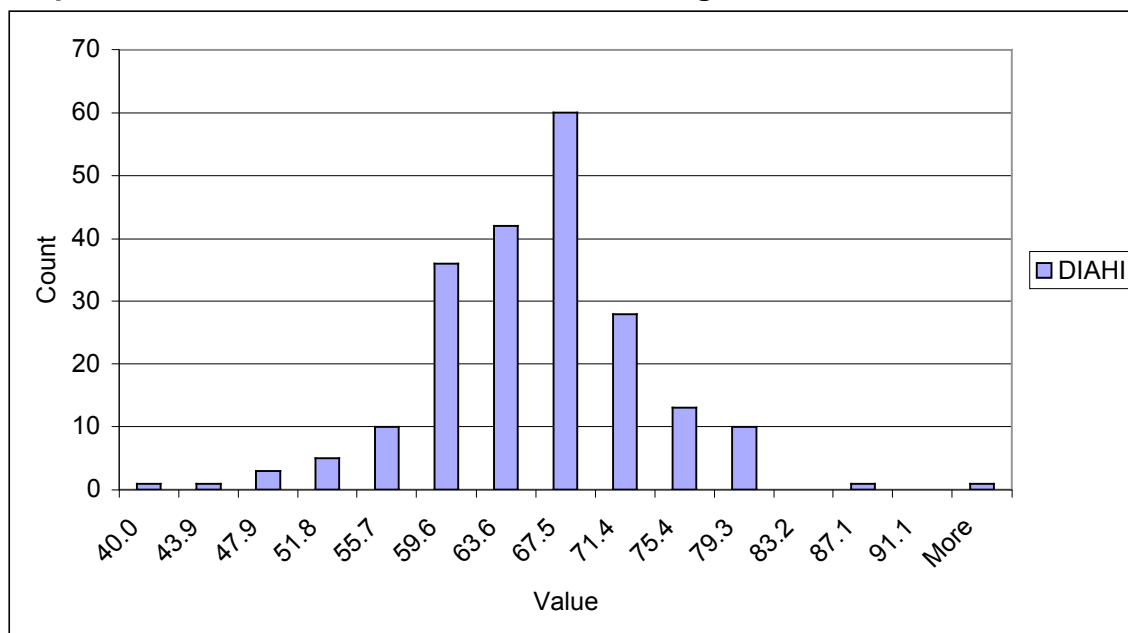
**Table 1.20 – Statistical Measurements for T19**

MEASUREMENT	SYSHI	DIAHI	PULSEHI	WEIGHT	O2HI
Mean	127.4882	63.9716	77.7867	130.6791	94.9565
Standard Error	0.9313	0.5012	0.9665	0.5350	0.1717
Median	126	64	76	131	95
Mode	126	67	90	130	95
Standard Deviation	13.5286	7.2801	14.0390	7.8439	2.4698
Sample Variance	183.0225	52.9992	197.0924	61.5274	6.1000
Kurtosis	0.7653	1.7221	-0.9687	3.5455	44.4628
Skewness	0.4606	0.0675	0.0071	0.0725	-5.1227
Range	78	55	58	72	29
Minimum	93	40	46	100	71
Maximum	171	95	104	172	100

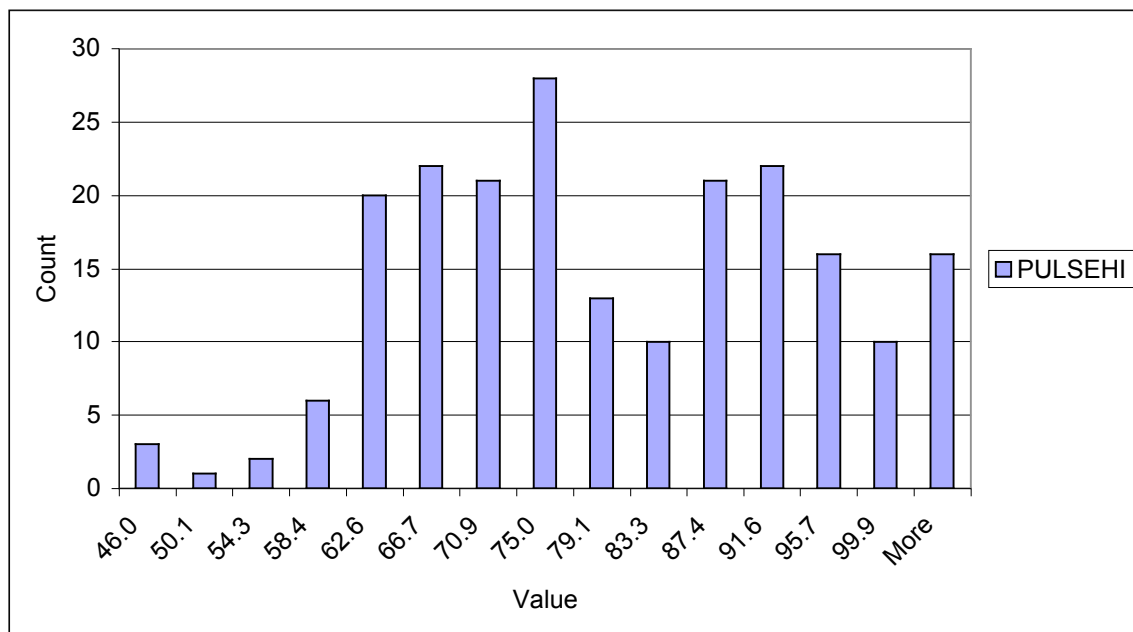
**Graph 1.110 – Distribution of Systolic Readings for T19**



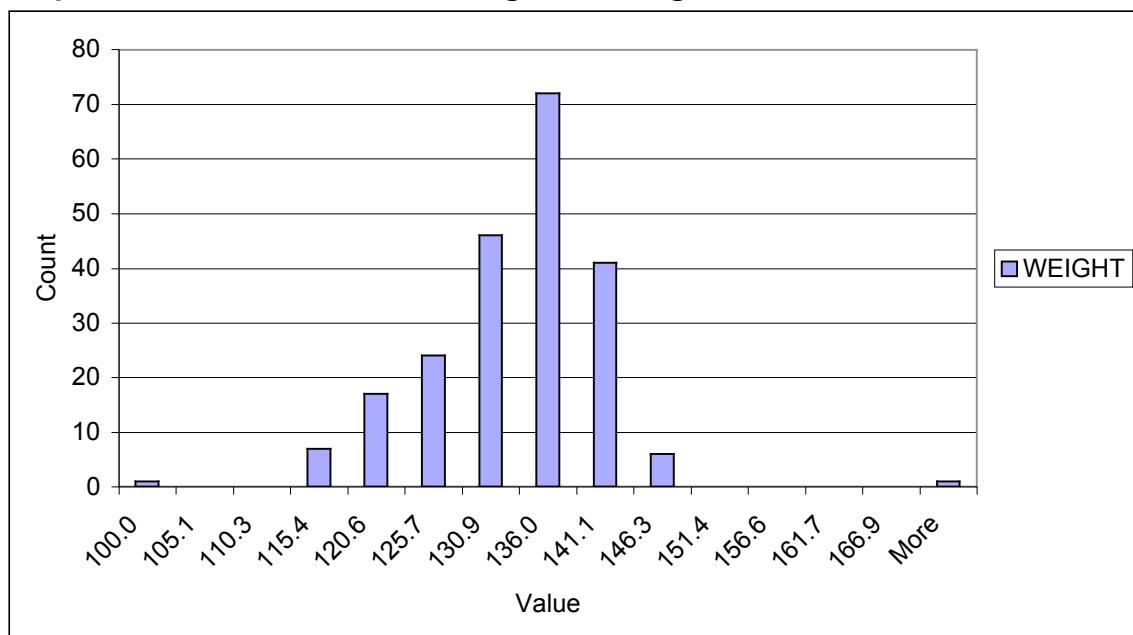
**Graph 1.111 – Distribution of Diastolic Readings for T19**



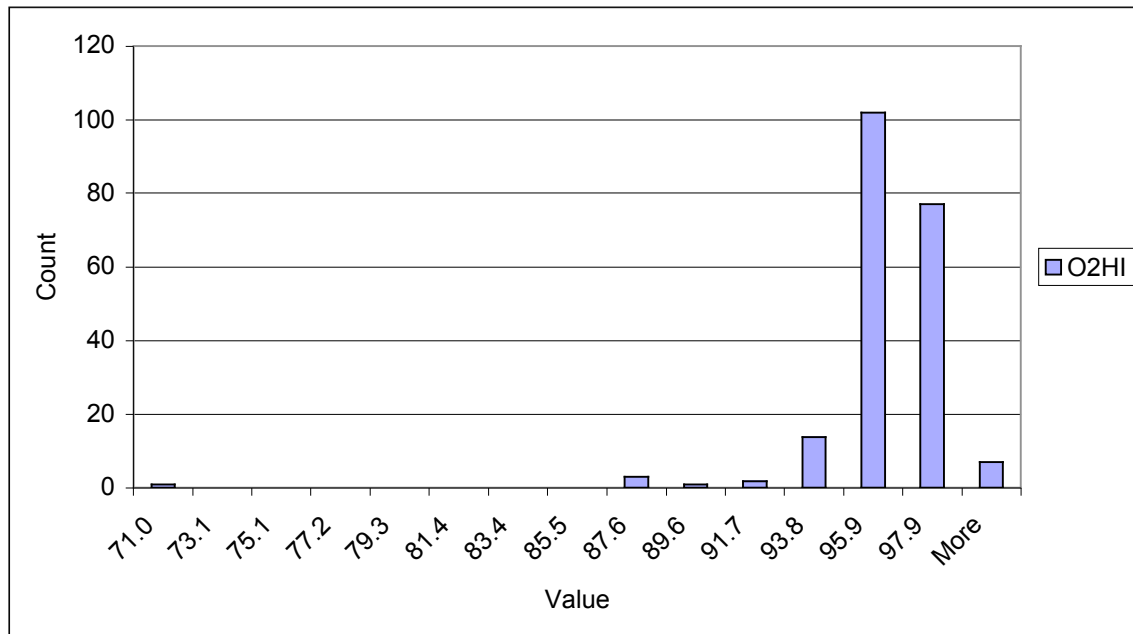
**Graph 1.112 – Distribution of Pulse Readings for T19**



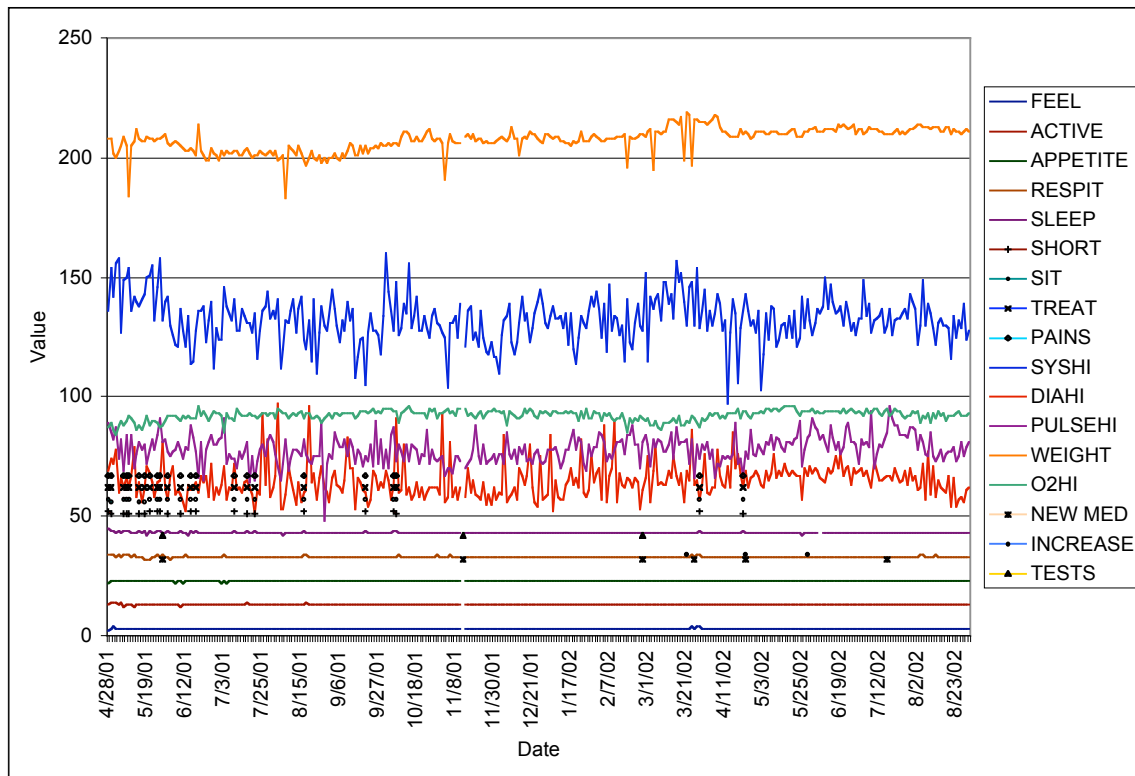
**Graph 1.113 – Distribution of Weight Readings for T19**



**Graph 1.114 – Distribution of O2 Readings for T19**



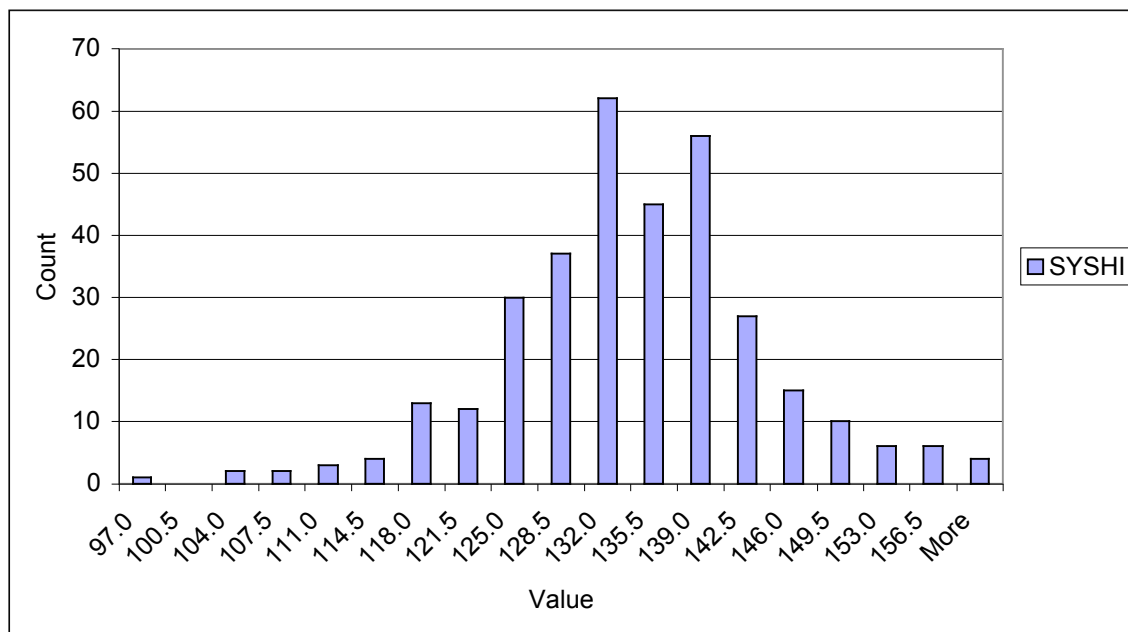
**Graph 1.115 – T20 Composite Data**



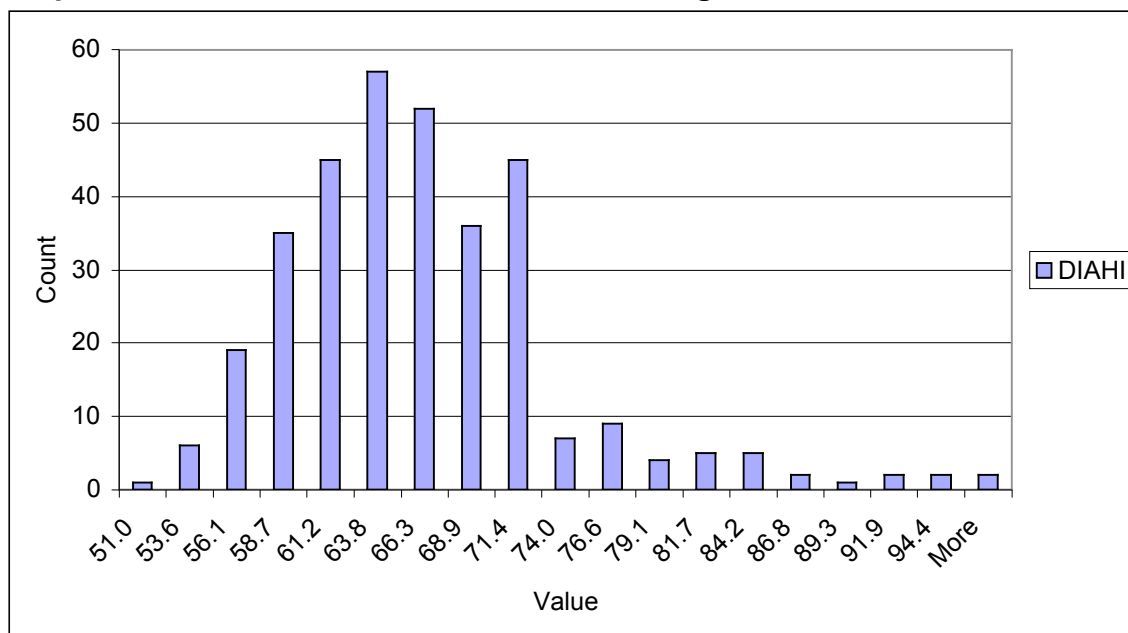
**Table 1.21 – Statistical Measurements for T20**

MEASUREMENT	SYSHI	DIAHI	PULSEHI	WEIGHT	O2HI
Mean	132.5642	64.9522	78.0239	207.6179	92.2657
Standard Error	0.5339	0.4105	0.3117	0.2703	0.1165
Median	133	64	78	208	93
Mode	136	62	78	211	93
Standard Deviation	9.7723	7.5139	5.7048	4.9480	2.1314
Sample Variance	95.4981	56.4588	32.5443	24.4823	4.5430
Kurtosis	0.9705	3.0136	1.9504	2.6312	1.2303
Skewness	-0.1566	1.3766	-0.2206	-0.9831	-0.9813
Range	63	46	48	36	12
Minimum	97	51	48	183	84
Maximum	160	97	96	219	96

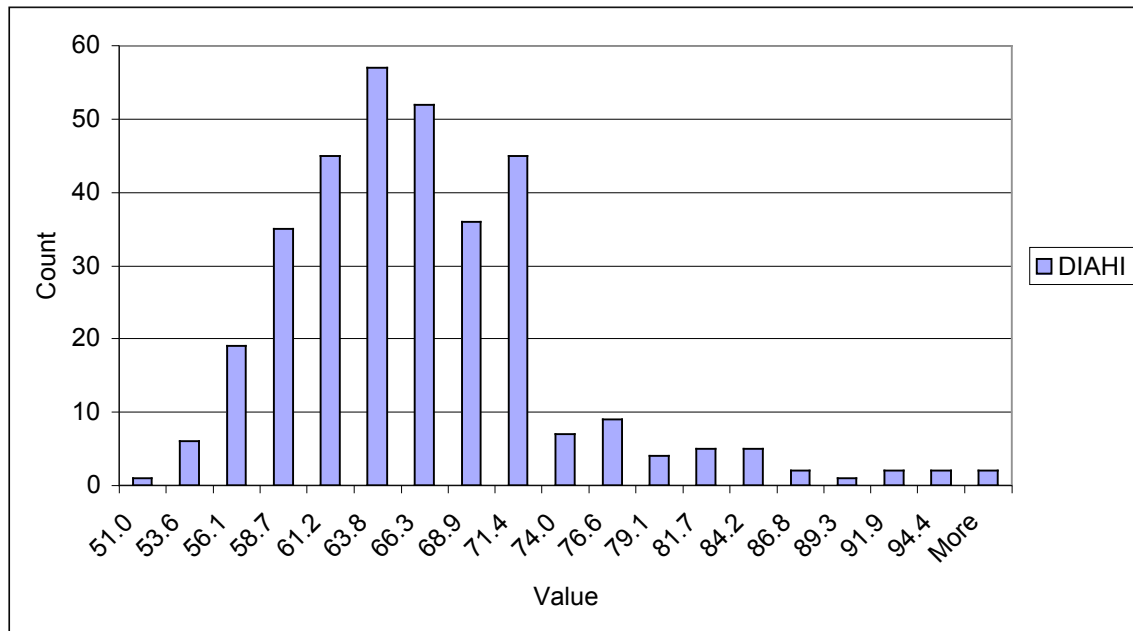
**Graph 1.116 – Distribution of Systolic Readings for T20**



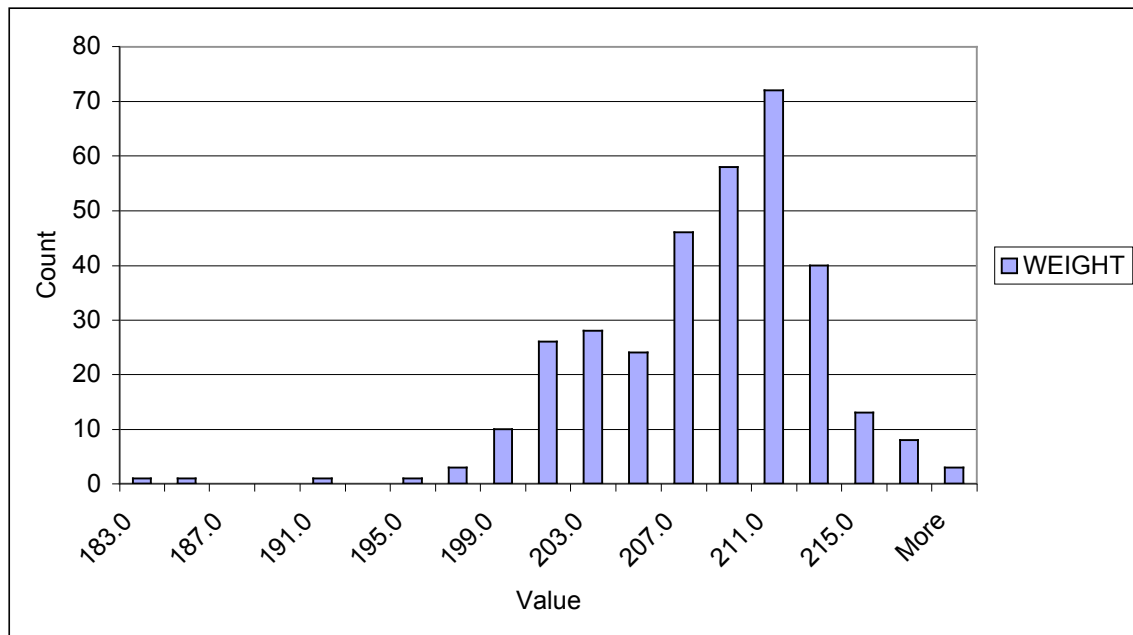
**Graph 1.117 – Distribution of Diastolic Readings for T20**



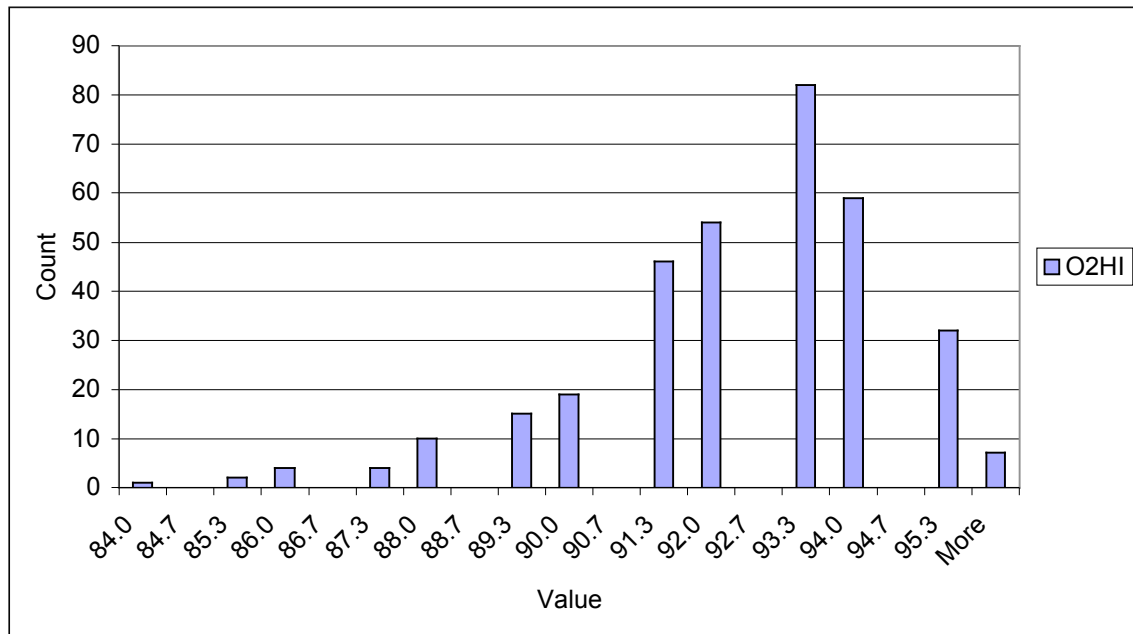
**Graph 1.118 – Distribution of Pulse Readings for T20**



**Graph 1.119 – Distribution of Weight Readings for T20**

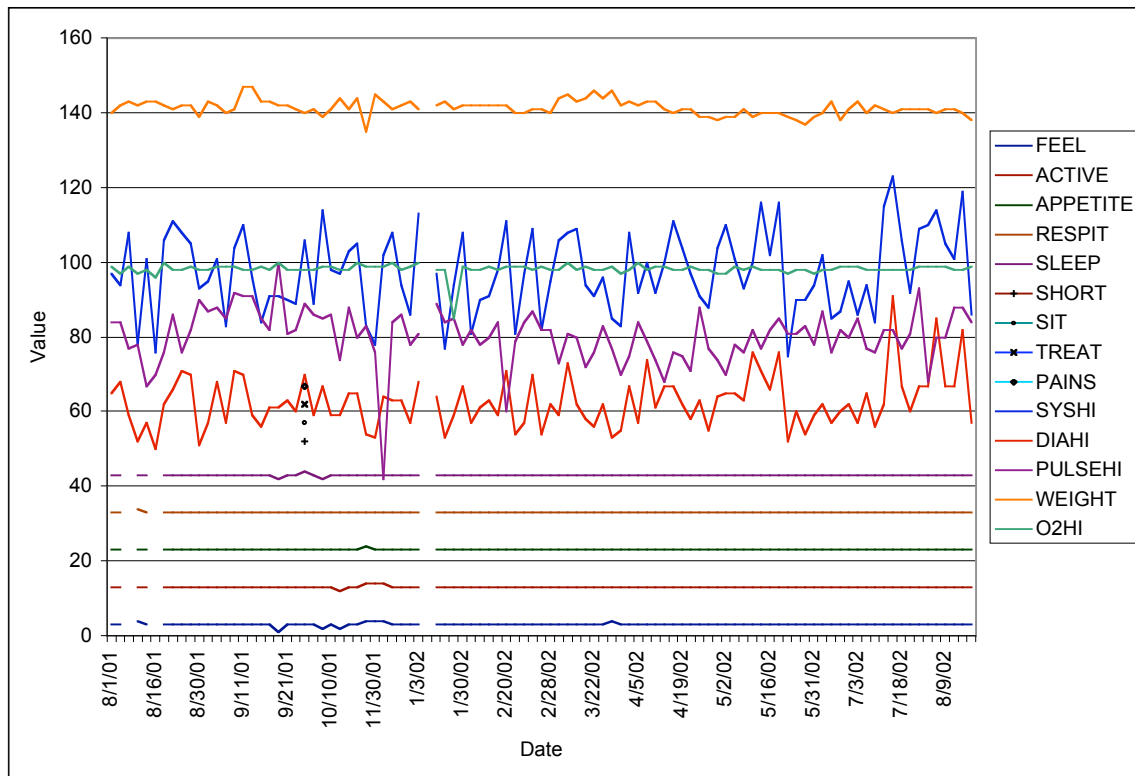


**Graph 1.120 – Distribution of O2 Readings for T20**





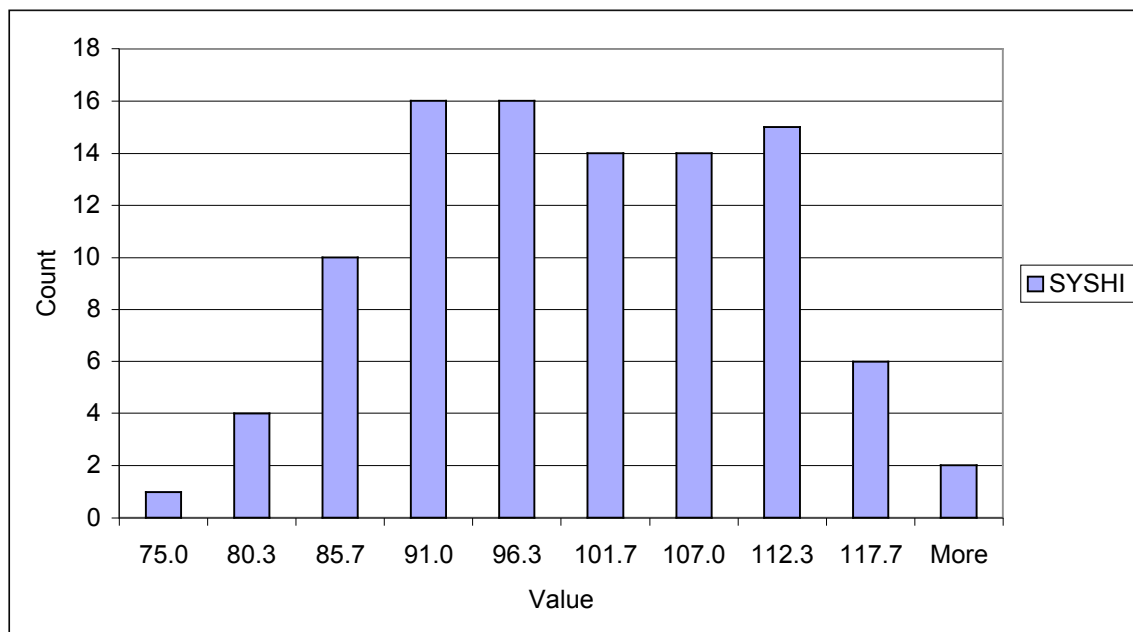
**Graph 1.121 – T21 Composite Data**



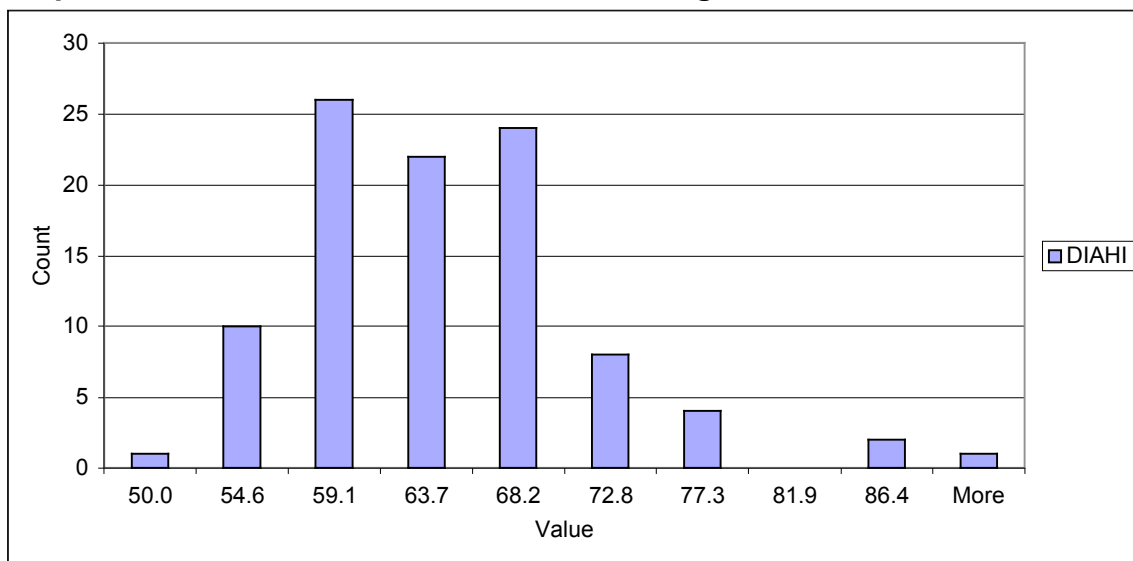
**Table 1.22 – Statistical Measurements for T21**

MEASUREMENT	SYSHI	DIAHI	PULSEHI	WEIGHT	O2HI
Mean	97.5204	62.6735	80.3878	141.3980	98.2653
Standard Error	1.0929	0.7236	0.7487	0.2055	0.1573
Median	97	62	81	141	98
Mode	94	57	82	141	98
Standard Deviation	10.8193	7.1634	7.4122	2.0344	1.5568
Sample Variance	117.0563	51.3150	54.9409	4.1390	2.4237
Kurtosis	-0.6887	2.3407	6.9036	1.0485	54.9337
Skewness	-0.0067	1.0854	-1.4989	0.1544	-6.4454
Range	48	41	58	12	15
Minimum	75	50	42	135	85
Maximum	123	91	100	147	100

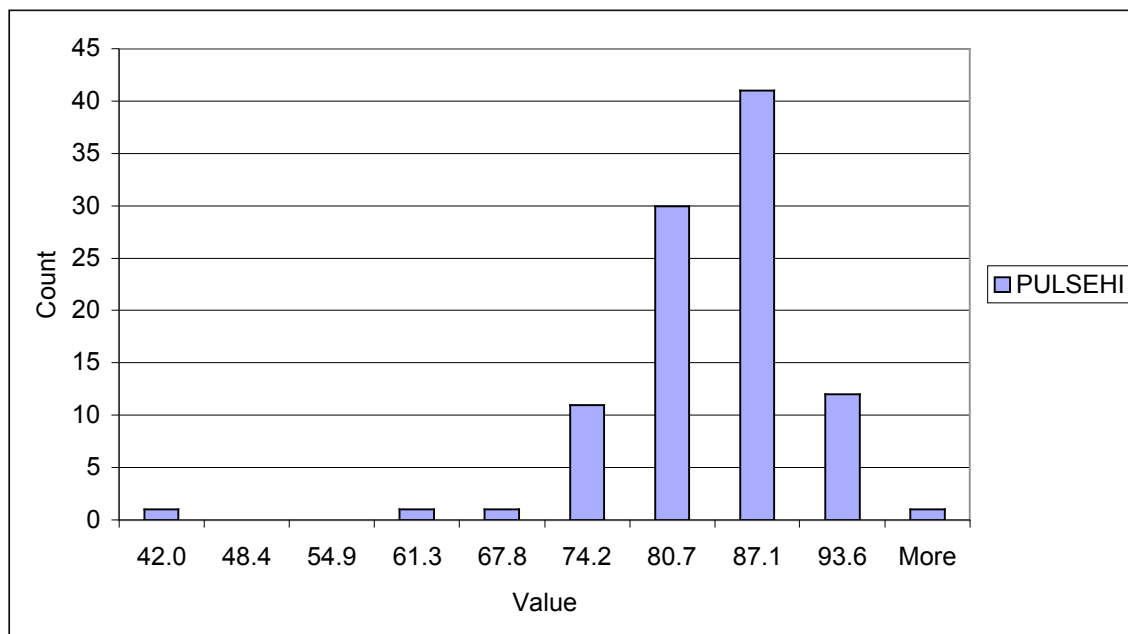
**Graph 1.122 – Distribution of Systolic Readings for T21**



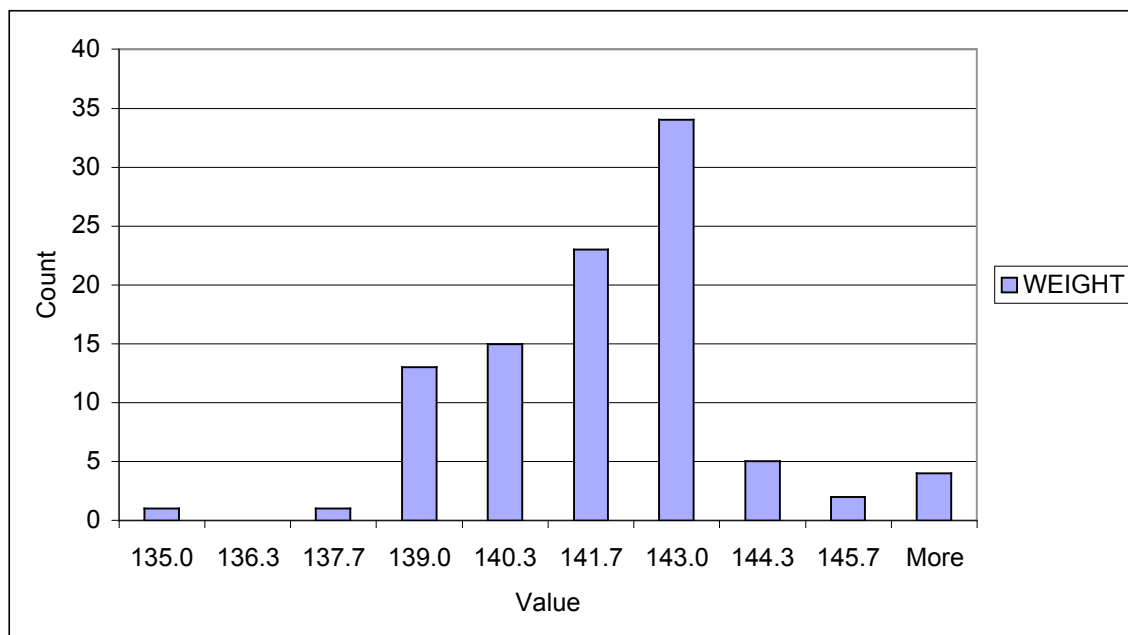
**Graph 1.123 – Distribution of Diastolic Readings for T21**



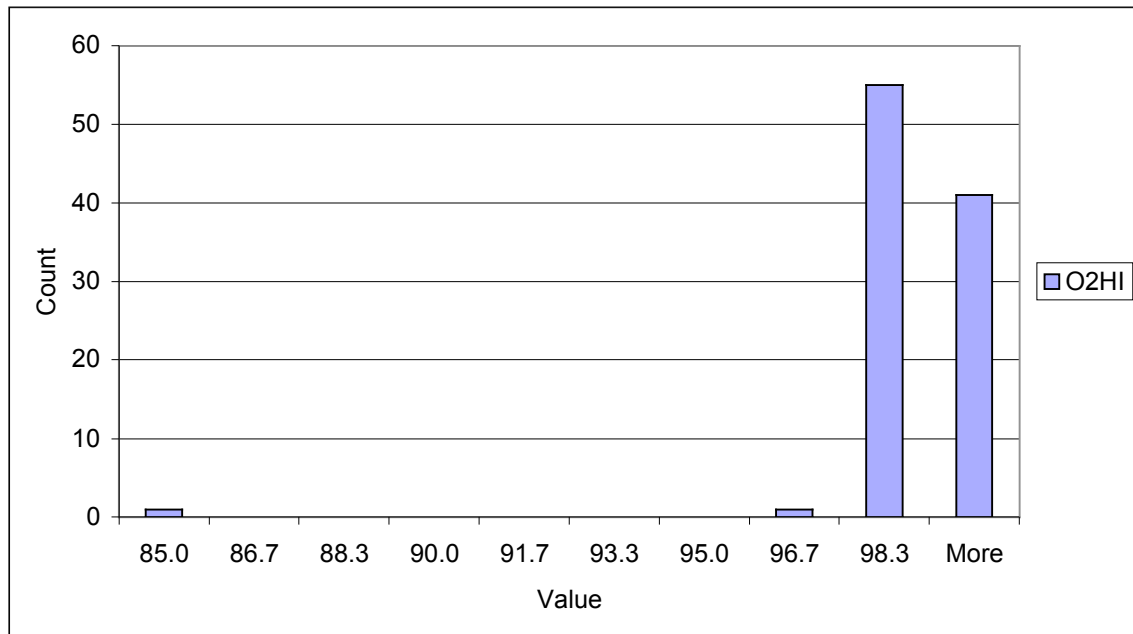
**Graph 1.124 – Distribution of Pulse Readings for T21**



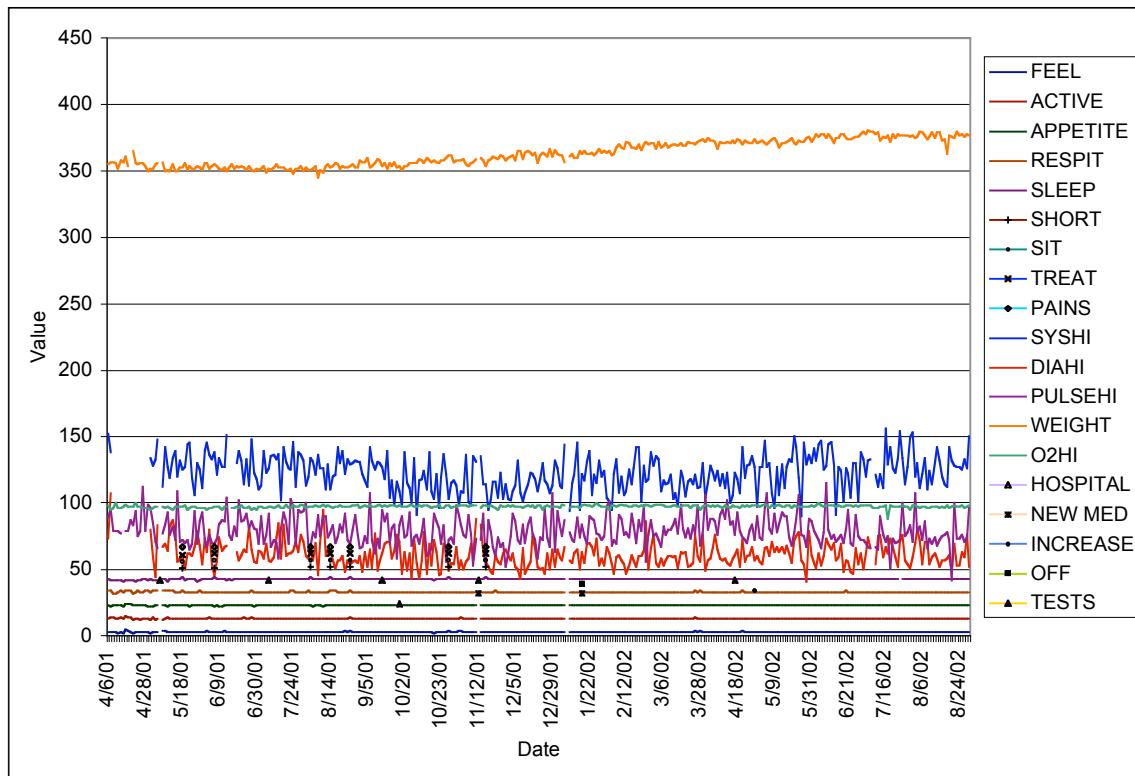
**Graph 1.125 – Distribution of Weight Readings for T21**



**Graph 1.126 – Distribution of O2 Readings for T21**



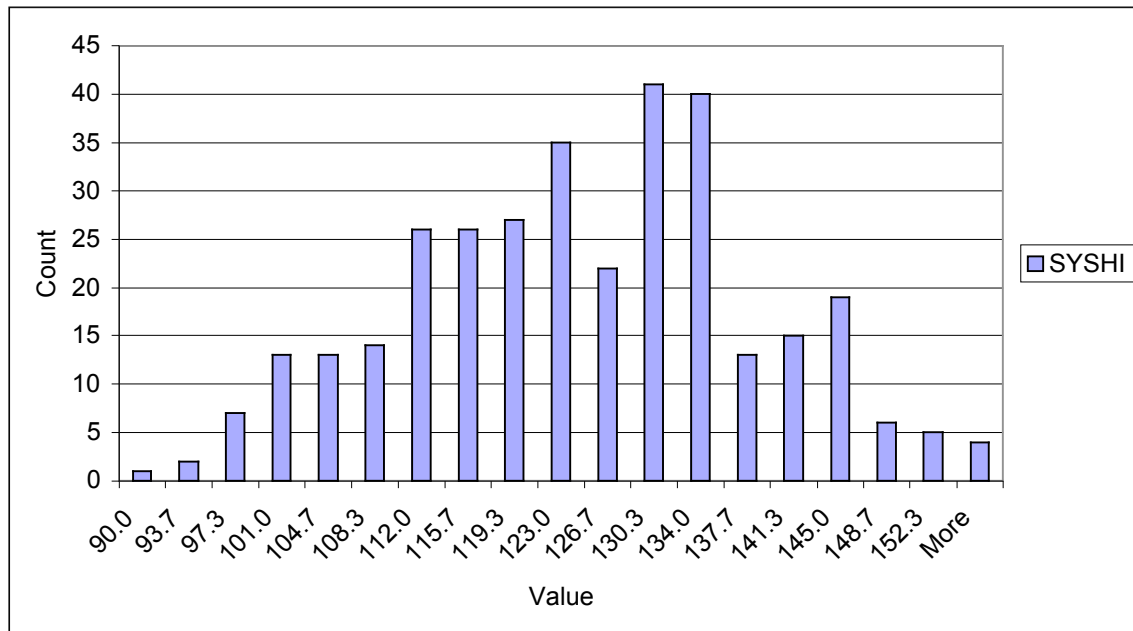
**Graph 1.127 – T22 Composite Data**



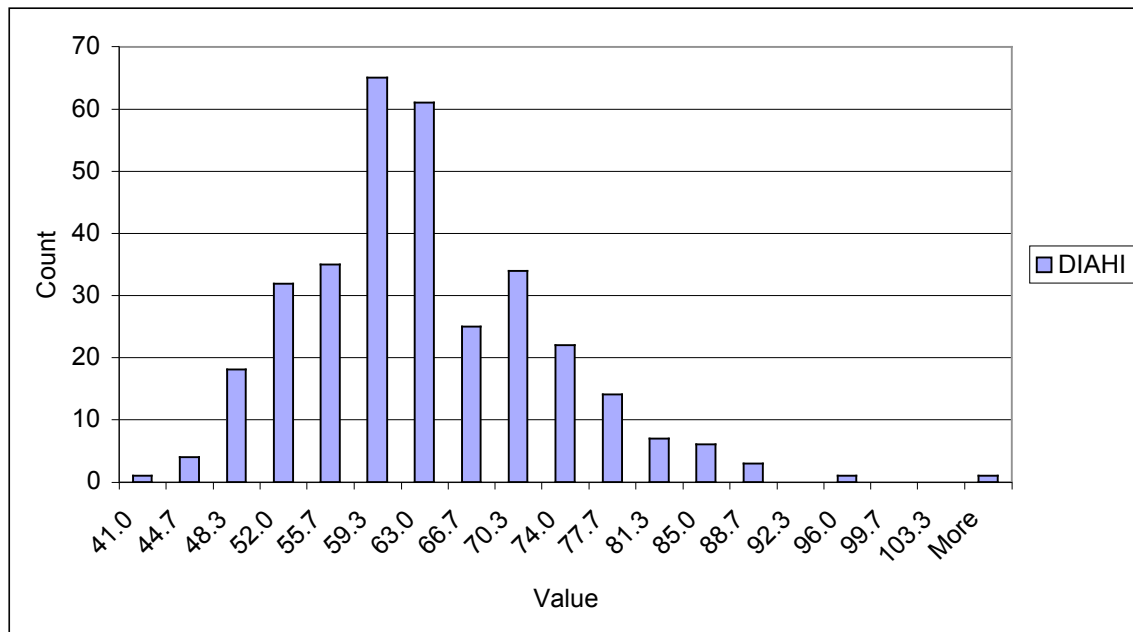
**Table 1.23 – Statistical Measurements for T22**

MEASUREMENT	SYSHI	DIAHI	PULSEHI	WEIGHT	O2HI
Mean	122.9970	61.3161	79.1623	363.4740	97.1879
Standard Error	0.7529	0.5254	0.6070	0.5056	0.0578
Median	124	60	77	362	97
Mode	127	57	72	354	97
Standard Deviation	13.6568	9.5297	11.2737	9.4046	1.0751
Sample Variance	186.5091	90.8144	127.0957	88.4471	1.1559
Kurtosis	-0.4643	1.4941	0.3630	-1.4011	14.7087
Skewness	-0.0676	0.8310	0.3818	0.1595	-1.7736
Range	66	66	73	36	12
Minimum	90	41	42	345	88
Maximum	156	107	115	381	100

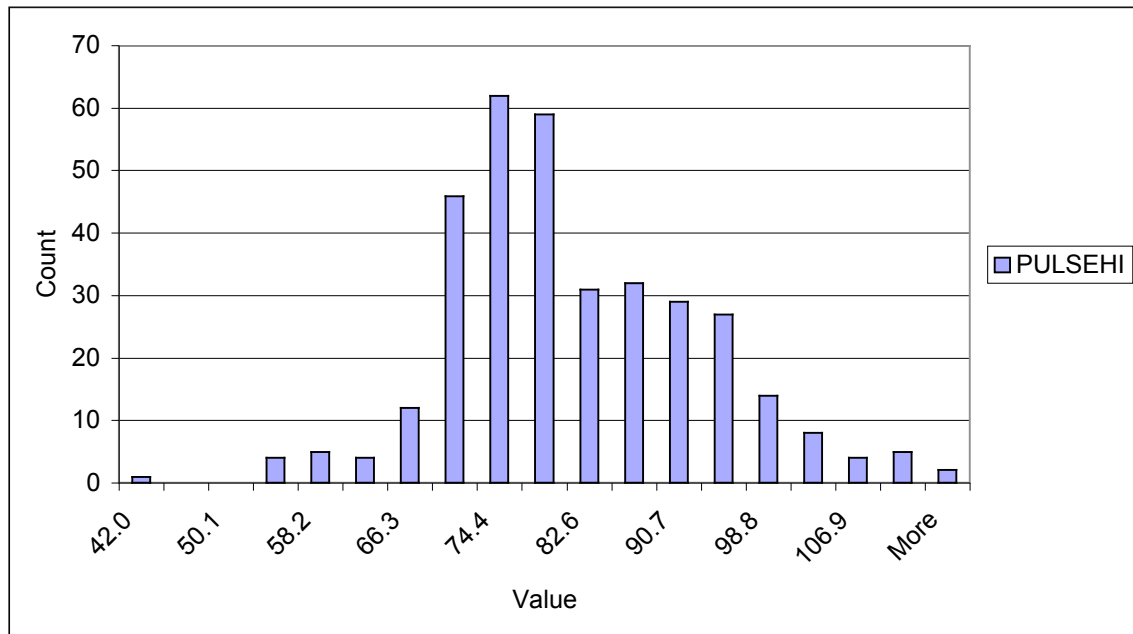
**Graph 1.128 – Distribution of Systolic Readings for T22**



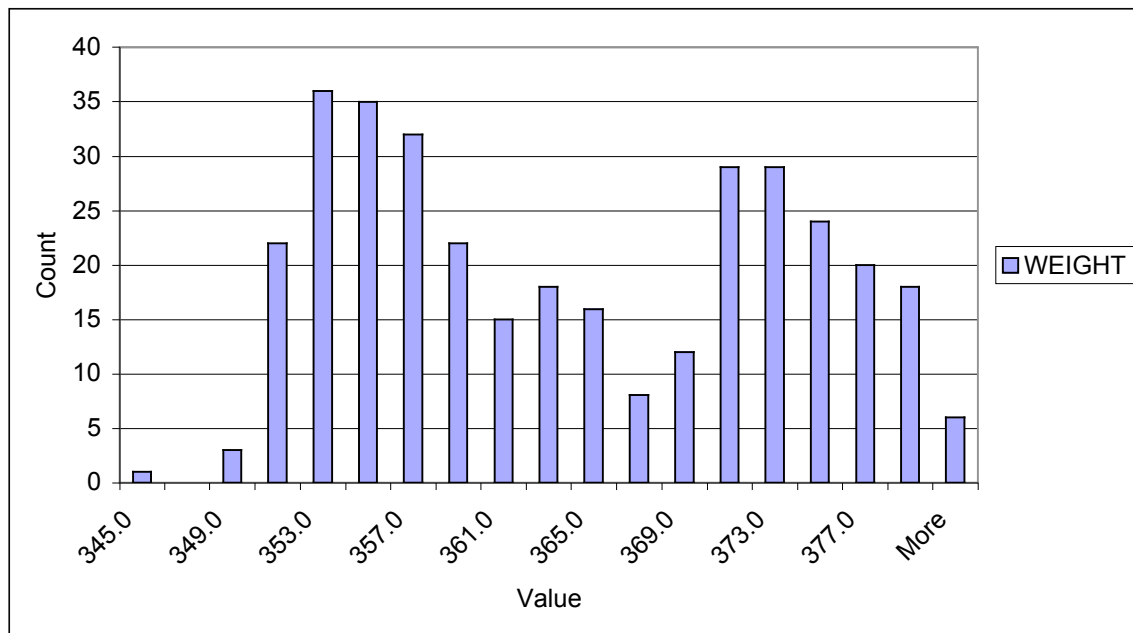
**Graph 1.129 – Distribution of Diastolic Readings for T22**



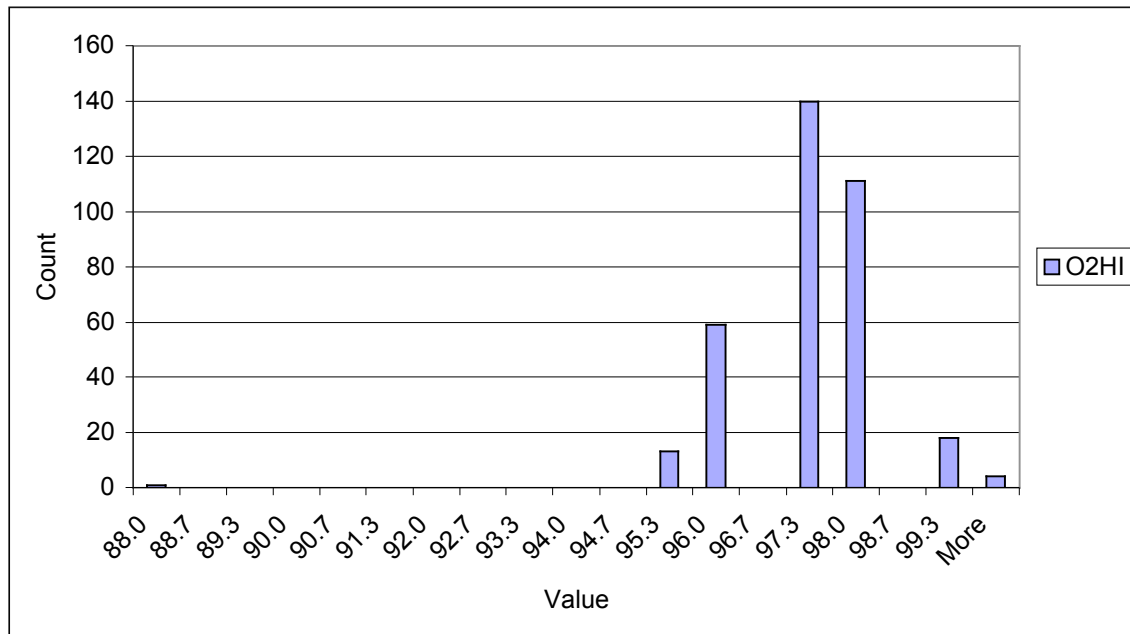
**Graph 1.130 – Distribution of Pulse Readings for T22**



**Graph 1.131 – Distribution of Weight Readings for T22**

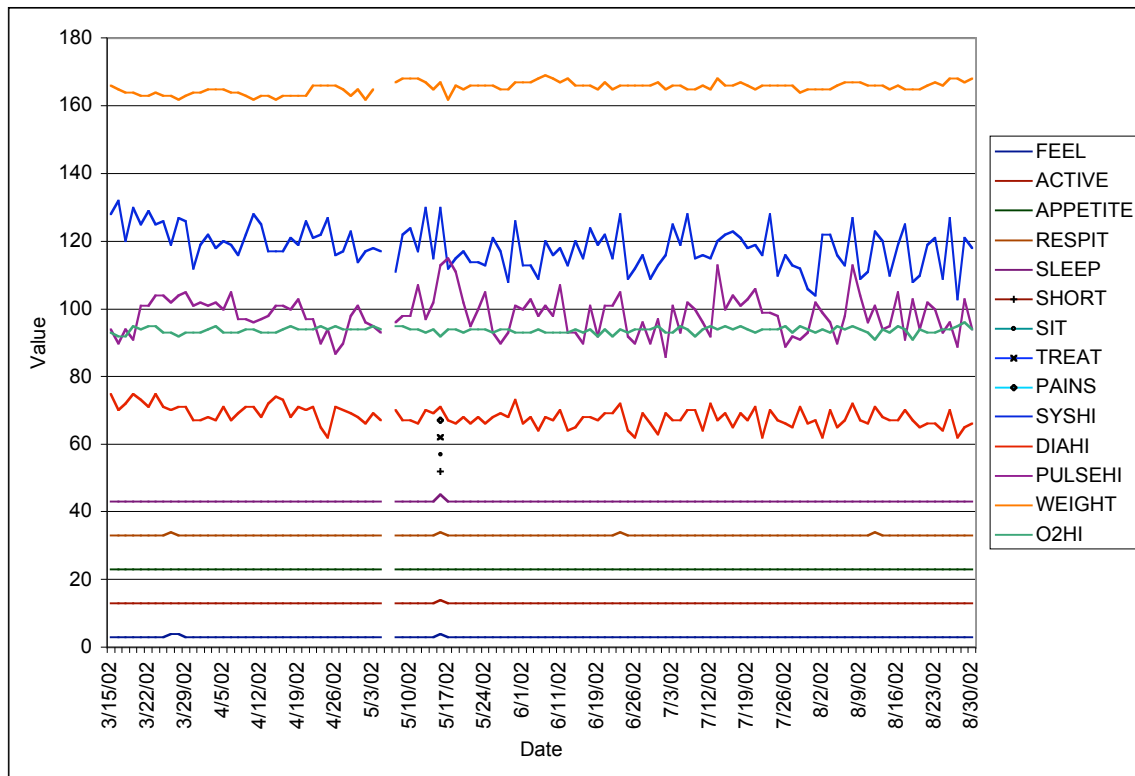


**Graph 1.132 – Distribution of O2 Readings for T22**





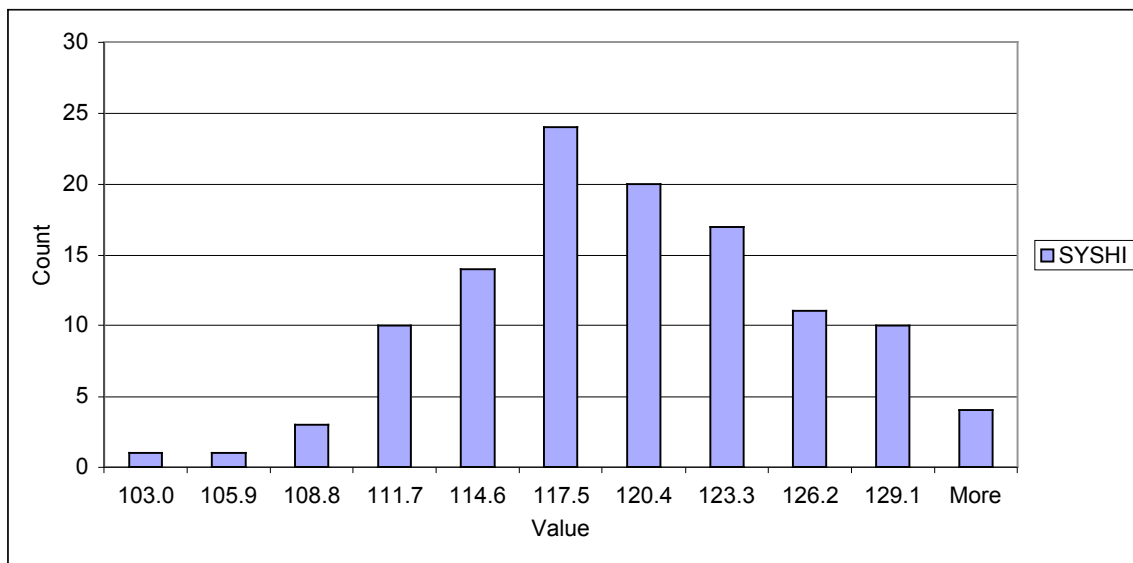
**Graph 1.133 – T23 Composite Data**



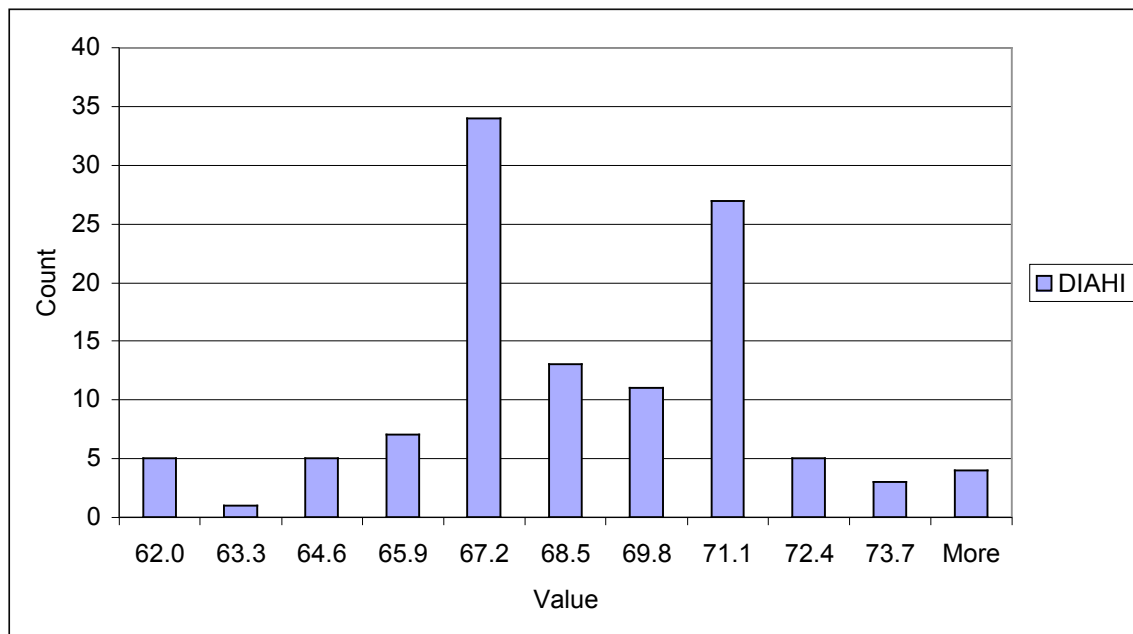
**Table 1.24 – Statistical Measurements for T23**

MEASUREMENT	SYSHI	DIAHI	PULSEHI	WEIGHT	O2HI
Mean	118.4522	68.1565	98.3391	165.4474	93.7304
Standard Error	0.5753	0.2685	0.5371	0.1485	0.0859
Median	118	68	98	166	94
Mode	119	67	101	166	94
Standard Deviation	6.1690	2.8794	5.7596	1.5858	0.9207
Sample Variance	38.0569	8.2911	33.1735	2.5149	0.8477
Kurtosis	-0.4333	-0.1275	0.2269	-0.3028	0.3282
Skewness	-0.0497	0.0560	0.3601	-0.3356	-0.3956
Range	29	13	29	7	5
Minimum	103	62	86	162	91
Maximum	132	75	115	169	96

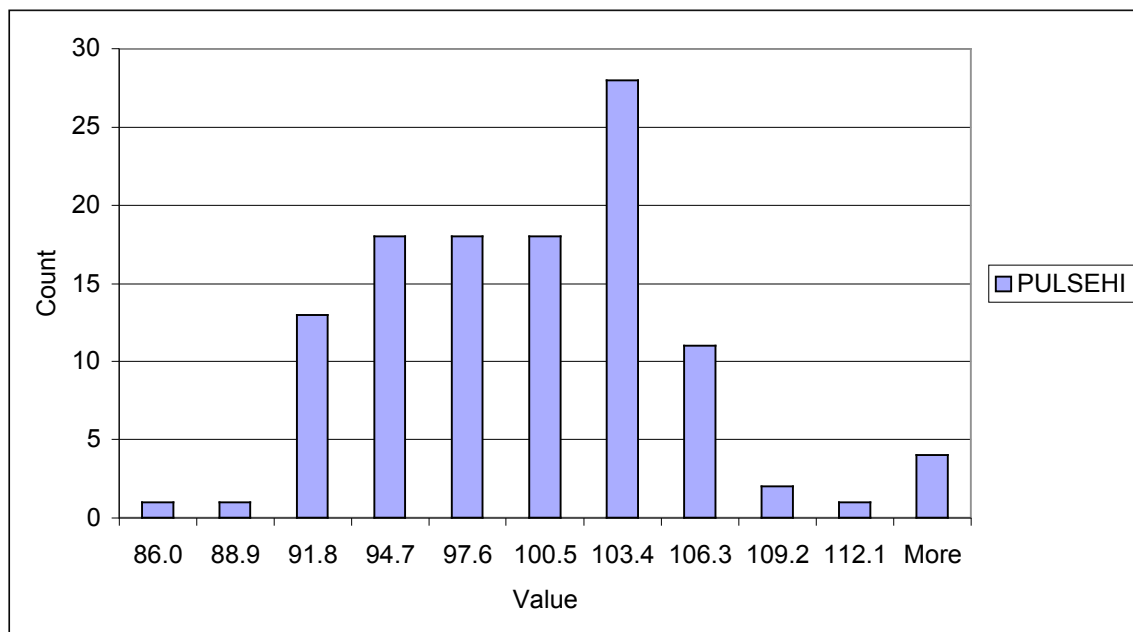
**Graph 1.134 – Distribution of Systolic Readings for T23**



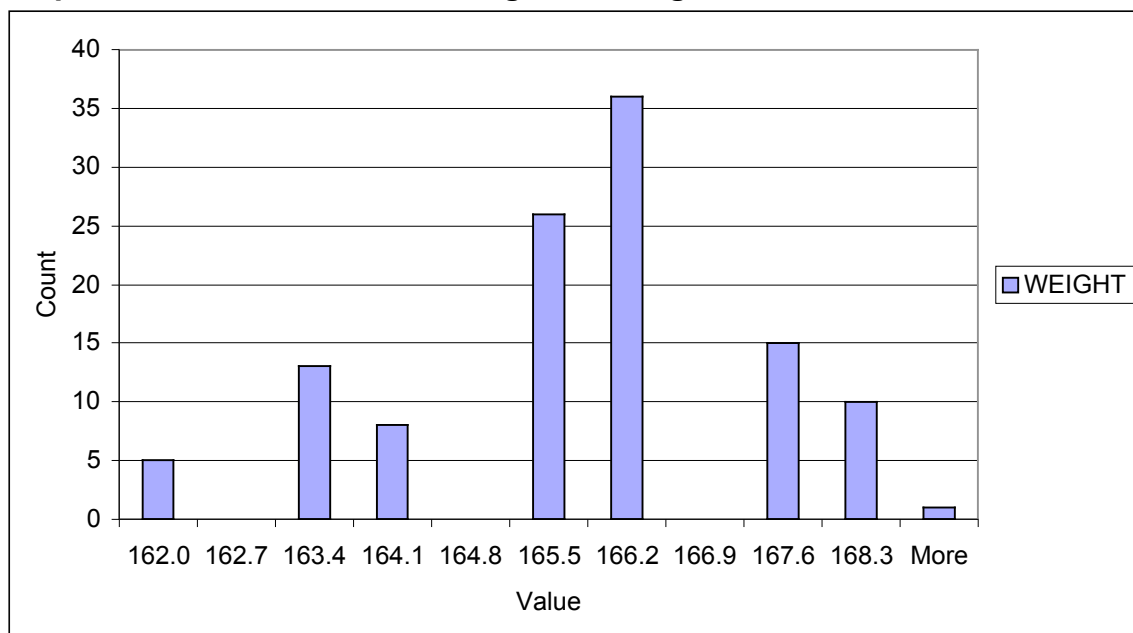
**Graph 1.135 – Distribution of Diastolic Readings for T23**



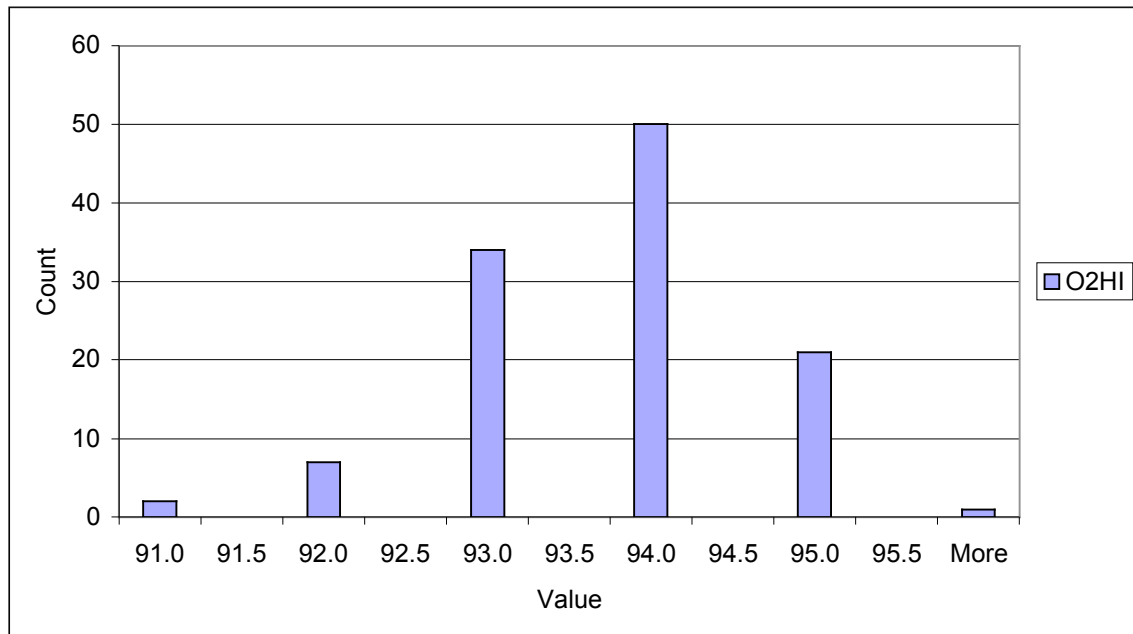
**Graph 1.136 – Distribution of Pulse Readings for T23**



**Graph 1.137 – Distribution of Weight Readings for T23**



**Graph 1.138 – Distribution of O2 Readings for T23**



## **Section Two**

### **Monitoring Costs**

The distortions caused by the third party pay system in the healthcare industry make it difficult to determine the true costs and benefits of different avenues of treatment. In this section we lay out the costs that were incurred in operating the HMS grant with twenty-three patients in the treatment group. The vast majority of these individuals believe that the costs incurred were very beneficial.<sup>1</sup> However, the eligibility of these expenses from the perspective of the third party payers is not assured.

In this study the equipment costs were the vital statistics monitoring equipment in the patients' homes and the computer equipment in the central office. These fixed costs averaged \$4,129 on a per patient basis over the eighteen-month study period. The useful life of the equipment was not determined, but it seems reasonable that the equipment would last about five years. Again, we must stress that if the equipment is rented and reused then the cost is likely to be reduced. However, if the patient purchases the equipment and it is not reused, then the total cost is assigned to a single user. Of course, the third option of an initial rental period followed by a purchase would produce yet another cost for the equipment.

The other major costs associated with the HMS equipment are the labor costs associated with the monitoring technicians and the network analyst. Labor costs vary by the skill level associated with the individual and the job and by the particular labor market location. Our study was located in an isolated labor market with a large population of university students. It is quite likely that our labor costs are less than those in more metropolitan communities. The project used one full time equivalent monitoring technician. And, after the initial set-up

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<sup>1</sup> See the patient comments section of the exit interviews in Section 4.

phase a quarter time network analyst was employed. Table 2.1 shows the monthly costs associated with these individuals.

**Table 2.1, Labor Costs per Month**

Classification	Total Positions	Wages	Benefits	Total
Monitoring Technicians	1 FTE	\$1,686	\$254	\$1,940
Network Analyst	.25 FTE	\$623	\$160	\$783
Total Labor Costs		\$2,309	\$414	\$2,723

There were no telecommunications costs for this project because the telephone calls to transmit the vital statistics data to the central office were local calls. However, some minor travel costs were associated with maintaining the equipment in the patients' homes. These travel costs averaged less than \$70 per month.

In summary, the fixed costs per patient associated with the HMS of COPD/CHF are the machine costs of \$4,129. The variable costs per month are \$2,793 for twenty-three patients (\$121 per patient). Table 2.2 shows the fixed costs, variable costs, and total costs on a per patient basis assuming that the patient uses the equipment for three years.

**Table 2.2, Costs per Patient**

Costs	Three Years	One Year	Per Month <sup>2</sup>
Fixed Costs	\$4,129	\$4,129	\$115
Variable Costs	\$4,372	\$1,452	\$121
Total Costs	\$8,501	\$5,581	\$236

In order for this approach to COPD/CHF treatment to be cost-benefit efficient the benefits need only exceed either \$8,501 in a three-year period or

<sup>2</sup> Fixed costs of \$115 per month are an accounting allocation. The cost of the equipment is \$4,129 per patient regardless of how long the equipment is used by the patient.

\$236 per month on a per patient basis. In the next chapter that examines hospital costs and physician costs the results show that the average benefits that arise from reduced costs in these areas exceed the cost of the HMS.

## **Section Three**

### **Analysis of the Home Monitoring Study Quantitative Data**

#### Introduction

The analysis in this section focuses on two groups of patients, the treatment group and the control group over two 17-month time periods, a pre-study period and the study period. There are three variables of interest; hospital costs, hospital visits and days, and doctor costs and visits. Although the sample size is quite small the results indicate that treatment group patients during the study period had lower costs and fewer and shorter visits when compared with the pre-study period and with the control group.

#### Data

The data collected for this study represent three broad measurable quantitative areas of impact: 1) Hospital Costs, 2) Hospital Visits and Hospital Days, and 3) Doctor Costs and Visits. Within these three areas the data is divided into those costs and visits related to COPD/CHF, and those costs and visits associated with *all* medical conditions. Those costs/visits associated only with the focus conditions are labeled in the data sets as “Targeted.”

Data was collected on both treatment and control group patients. The patients were randomly assigned to either the treatment or control group from a population of chronic patients. There were 17 patients in the control group and 24 patients in the treatment group.

The study period lasted 17 months. Data was collected for the study period and for the 17 months prior to the study. This yields two time periods of data for each set of costs/visits, the “Study Period” and “Pre-study Period.”



## Methodology

Due to the small sample size the most useful comparative tool between the two groups is to compare averages. However, since these were rather small groups there is a problem with outliers skewing the average. It was determined that the most accurate picture would be provided comparing the averages of those patients that actually incurred costs or visits. Some patients in each group had no costs or visits. These zero values negatively skew the average. Similarly, a very large cost for a single patient can exert a positive skew to the average. Therefore, one table for hospital costs makes a further adjustment by removing the largest value (patient cost) from each group before averaging.

There are at least three useful ways to use this quantitative data to determine whether the study results of home monitoring were positive and significant:

1. Compare the costs/visits of the study group vs. control group.
2. Compare the study period costs/visits vs. the pre-study costs/visits.
3. Compare the degree of change between the sets or groups when they move in the same direction.

## Results

### *Hospital Costs*

In all comparisons the resulting hospital costs of the treatment group display a positive study effect. Home monitoring reduces hospital costs (see Tables 3.1 and 3.2 for data that inform the hospital costs analysis). During the study period, the treatment group's targeted costs were \$3,096 less than (or 87% of) the control group's targeted costs. If the largest outlier data are removed from both groups the difference climbs to \$4,316. The treatment group's total medical costs were \$10,338 less than (or 68% of) the control group's total medical costs during the study period.

These study period results are buttressed by noting that during the pre-study period the treatment group's costs are significantly higher (246% higher for targeted costs, and 140% higher for total costs) than the control group's.

The study also shows positive results from a time-series perspective. Targeted costs were \$15,943 less (66%) and total costs were \$5,336 less (81%) when the 17 months of the study period are compared with the prior 17 months (pre-study period). If the groups are adjusted by removing the highest values, the targeted costs difference amounts to \$9,890, while total costs equal \$3,455. The costs for the control group were actually much higher during the study period compared to the pre-study period (161% higher for targeted costs and 165% for total costs).

**Table 3.1 – Hospital Costs**Treatment Group

<u>Patient</u>	<u>StudyPeriodTargetCosts</u>	<u>StudyPeriodTotalCosts</u>	<u>PreStudyTargetCosts</u>	<u>PreStudyTotalCosts</u>
T01	\$1,283	\$3,677		\$41
T02	\$6,877	\$6,877	\$7,672	\$9,086
T03				\$674
T04		\$1,454	\$367	\$367
T05	\$2,323	\$2,323	\$7,135	\$7,502
T06	\$1,868	\$2,028		\$1,234
T07	\$1,951	\$1,951	\$27,656	\$27,656
T08	\$112,626	\$158,475	\$82,319	\$82,319
T09	\$38,617	\$38,617	\$176,301	\$176,491
T10	\$5,039	\$5,039		
T11	\$10,833	\$13,528	\$10,145	\$10,145
T12				
T13	\$7,614	\$7,614		
T14		\$4,396		
T15	\$62,721	\$64,735	\$495	\$2,298
T16	\$13,452	\$13,452	\$2,751	\$2,955
T17		\$9,260		\$1,111
T18			\$138,469	\$138,469
T19	\$5,240	\$17,198	\$10,448	\$11,065
T21		\$2,083		\$5,345
T22	\$11,032	\$12,309	\$22,463	\$22,835
DT1	\$41,039	\$41,039		
DT2		\$42,938	\$557	\$557
<i>Avg. by Entry</i>	\$21,501	\$22,450	\$37,444	\$27,786
<i>Avg. of Group</i>	\$13,438	\$18,708	\$20,282	\$20,840
<i>Adjusted Avg.</i>	\$13,993	\$14,526	\$23,883	\$17,981
<u>Control Group</u>				
C01	\$47,265	\$85,848	\$6,176	\$6,176
C02	\$34,015	\$34,015	\$26,362	\$28,965
C03	\$27,439	\$32,421	\$2,140	\$10,326
C04		\$13,591	\$8,439	\$14,771
C05	\$62,884	\$62,884	\$28,838	\$28,898
C06		\$15,347	\$14,344	\$49,148
C07	\$2,693	\$6,269	\$32,520	\$55,149
C08	\$72	\$38,377	\$28,747	\$30,581
C09				
C10			\$12,617	\$13,728
C11		\$5,583		
C12	\$43,213	\$119,333	\$13,231	\$18,323
C13		\$2,330		\$956
C14	\$26,402	\$26,515	\$2,096	\$2,770
C15			\$320	\$320
C16	\$1,623	\$2,097	\$24,851	\$24,851
CD1	\$363	\$14,416	\$12,757	\$12,757
<i>Avg. by Entry</i>	\$24,597	\$32,788	\$15,246	\$19,848
<i>Avg. of Group</i>	\$14,469	\$27,002	\$12,555	\$17,513
<i>Adjusted Avg.</i>	\$18,309	\$24,264	\$12,923	\$16,171

### Table 3.2 – Hospital Cost Comparisons

#### Hospital Costs - Study Period

	<u>Treatment Group</u>	<u>Control Group</u>	<u>Difference</u>	<u>% Treatment/Control</u>
Target Costs	\$13,993	\$18,309	(\$4,316)	76%
Total Costs	\$14,526	\$24,264	(\$9,738)	60%

#### Hospital Costs - Pre Study Period

	<u>Treatment Group</u>	<u>Control Group</u>	<u>Difference</u>	<u>% Treatment/Control</u>
Target Costs	\$23,883	\$12,923	\$10,960	185%
Total Costs	\$17,981	\$16,171	\$1,810	111%

#### Hospital Costs - Treatment Group

	<u>Study Period</u>	<u>Pre Study Period</u>	<u>Difference</u>	<u>% Study/PreStudy</u>
Target Costs	\$13,993	\$23,883	(\$9,890)	59%
Total Costs	\$14,526	\$17,981	(\$3,455)	81%

#### Hospital Costs - Control Group

	<u>Study Period</u>	<u>Pre Study Period</u>	<u>Difference</u>	<u>% Study/PreStudy</u>
Target Costs	\$18,309	\$12,923	\$5,386	142%
Total Costs	\$24,264	\$16,171	\$8,093	150%

Table 3.2 compares the adjusted average hospital costs of those subjects who incurred costs. The average is adjusted by removing the costs of the subject who incurred the highest costs. The removal of this outlier provides a more accurate indication of average costs.

### *Hospital Visits and Days*

The measured effects of home monitoring were predominately positive as measured by hospital visits and days in the hospital (see Table 3.3). On average, for those needing hospitalization related to COPD/CHF, the typical treatment patient had one less hospital visit, and spent four fewer days in the hospital than the average control group patient. The average treatment group patient had one less visit and spent nine fewer days in the hospital than the average control group patient when the comparison is total (all) medical problems.

During the pre-study period the treatment group had an equal number of hospital visits and spent two more days on average for targeted problems than the control group. Additionally, the treatment group had two more visits and two more hospital days than the control group for all medical reasons during the pre-study period. This may bolster the implied benefits of the treatment group having lower visits/days during the study period.

The treatment group, on average, visited the hospital the same number of times related to target problems during home monitoring study period as during the prior 17 months. However, they spent four less days in the hospital during the study period. Treatment group subjects visited the hospital for all ("Total") reasons, on average, one more time during home monitoring study period than in the preceding period. On average they spent the same number of days in the hospital during both periods.

The control group exhibited reversed patterns compared to the study groups' patterns. For the control group the study period visits and days were higher than in the pre-study period for targeted problems, while all ("Total") visits/days were higher during the study period.

Although the treatment group worsened in one of four quantifiable measures from the pre-study period to the study period and remained constant in two others, the control group worsened in three of four measures and remained constant in only the last. Thus, a comparison of the treatment group with the control group over time shows that the treatment group fared better than the control group. The control group showed greater use of hospital treatment than the treatment group.

**Table 3.3 – Hospital Visits/Days**

<u>Patient</u>	<u>StudyTarget</u>			<u>StudyTotal</u>		<u>PreStudyTarget</u>			<u>PreStudy</u>
	<u>Days</u>	<u>Visits</u>	<u>Days</u>	<u>Visits</u>	<u>Days</u>	<u>Visits</u>	<u>Days</u>	<u>Visits</u>	<u>Total</u>
T01	1	1	1	3			1		1
T02	1	3	1	3	2	5	3		4
T03							1		1
T04			1	1	1	1	1		1
T05	1	1	1	1	1	4	3		6
T06	6	7	8	9			1		4
T07	2	2	2	2	4	21	4		21
T08	5	25	14	74	6	30	6		30
T09	3	4	3	4	10	51	11		52
T10	8	9	8	9					
T11	2	9	4	11	2	8	2		8
T12									
T13	1	6	1	6					
T14			3	3					
T15	4	18	5	19	1	1	1		3
T16	2	8	2	8	3	3	4		4
T17			2	5			1		1
T18									
T19	3	3	7	12	1	8	1		9
T20					7	29	7		29
T21			5	6			7		10
T22	2	4	3	5	4	12	5		13
TD1	3	31	3	31					
TD2			2	14	1	1	1		1
<i>Avg. by Entry</i>	<b>3</b>	<b>9</b>	<b>4</b>	<b>11</b>	<b>3</b>	<b>13</b>	<b>3</b>		<b>11</b>
<i>Avg. of Group</i>	<b>2</b>	<b>5</b>	<b>3</b>	<b>9</b>	<b>2</b>	<b>7</b>	<b>3</b>		<b>8</b>
<b>Control Group</b>									
C01	6	32	12	55	2	4	2		4
C02	1	12	1	12	3	14	4		16
C03	1	3	4	6	1	1	6		7
C04			6	20	1	6	3		14
C05	4	43	4	43	6	22	7		23
C06			2	10	1	9	5		19
C07	2	2	6	6	2	15	5		28
C08	1	1	3	22	4	19	7		22
C09									
C10					4	12	7		15
C11			6	6					
C12	12	19	13	52	7	10	12		16
C13			2	2			1		1
C14	8	19	9	20	2	2	3		3
C15					1	1	1		1
C16	1	1	2	3	12	26	17		26
CD1	1	1	5	19	2	7	2		7
<i>Avg. by Entry</i>	<b>4</b>	<b>13</b>	<b>5</b>	<b>20</b>	<b>3</b>	<b>11</b>	<b>5</b>		<b>13</b>
<i>Avg. of Group</i>	<b>2</b>	<b>8</b>	<b>4</b>	<b>16</b>	<b>3</b>	<b>9</b>	<b>5</b>		<b>12</b>

### *Doctor Costs and Visits*

The benefits of home monitoring as measured by doctor costs and visits are generally positive (see Table 3.4). During monitoring, the average treatment group patient spent slightly more (\$56) on targeted problem related doctor costs and visited their doctor two more times than the control patient. However, they spent \$1,152 less than the unmonitored control patient and visited the doctor three fewer times related to total health problems during that same period.

In the 17 months prior to home monitoring the treatment group had already established a lower average level of doctor costs and visits than control group subjects. They spent \$130 less (84%) and had 4 fewer visits during the pre-study period related to the targeted problems. They spent \$215 less (78%) and had 5 fewer visits related to all medical conditions. This may indicate a “predisposition” among the treatment group for less doctoring than the control group.

However, when the treatment group is compared over the two time periods the treatment group shows positive study effects again. For those targeted health problems, the treatment group’s average costs dropped \$129 (15%) and had one fewer doctor visits during the study period compared to the pre-study period. For total costs they spent \$87 less (11%) and had one less doctor visit.

The control group’s targeted doctor costs and visits dropped more than the treatment group between periods. The control group’s targeted doctor costs dropped \$313 (38%), while the number of doctor visits decreased by seven. These results conflict with the doctor costs/visit benefit claims reported for the treatment group. Also, note that total doctor costs and visits for the control group increased by \$132 (13%), while visits decreased by three from the pre-study period to the study period. These results seem to weaken the claim of positive



results from using the HMS with COPD/CHF patients. However, it is just as likely that these results come from the small sample size associated with the current study. Further study with larger sample sizes is needed.

**Table 3.4 – Doctor Costs and Visits**

<u>Patients</u>	<u>Target Study Period</u>		<u>Total Study Period</u>		<u>Target PreStudy Period</u>		<u>Total PreStudy Period</u>	
	<u>Dollars</u>	<u>Visits</u>	<u>Dollars</u>	<u>Visits</u>	<u>Dollars</u>	<u>Visits</u>	<u>Dollars</u>	<u>Visits</u>
<u>Treatment Group</u>								
T01	\$210	4	\$465	6	\$143	3	\$279	7
T02	\$530	6	\$530	6	\$725	10	\$725	10
T03	\$180	3	\$240	4	\$145	2	\$371	8
T04	\$178	4	\$513	8	\$170	3	\$225	3
T05	\$188	3	\$188	3	\$355	5	\$355	5
T06	\$250	4	\$250	4	\$115	2	\$115	2
T07	\$30	1	\$138	4	\$580	6	\$1,181	14
T08	\$770	7	\$770	7	\$2,755	23	\$2,805	24
T09	\$715	13	\$715	13	\$3,005	25	\$3,005	25
T10	\$460	8	\$518	9	\$115	2	\$131	4
T11	\$603	5	\$1,068	9	\$1,125	13	\$1,125	13
T12	\$215	5	\$283	7	\$913	13	\$1,834	19
T13	\$500	7	\$500	7	\$170	4	\$205	5
T14	\$120	2	\$520	9	\$250	5	\$250	6
T15	\$1,910	17	\$1,910	17	\$295	5	\$295	5
T16	\$935	13	\$935	13	\$260	5	\$260	5
T17	\$340	6	\$340	6	\$75	2	\$550	7
T18	\$3,060	34	\$3,060	34	\$510	7	\$799	14
T19	\$0	0	\$200	1	\$235	5	\$235	5
T20	\$510	7	\$510	7	\$2,273	20	\$2,273	20
T21	\$120	2	\$120	2	\$150	3	\$150	3
T22	\$418	7	\$418	7	\$1,375	19	\$1,375	19
T23	\$220	4	\$1,010	10	\$875	13	\$955	16
TD1	\$1,470	16	\$1,470	16	\$320	7	\$336	8
TD2	\$60	1	\$1,280	9	\$285	6	\$285	6
<i>Avg. of Entries</i>	<b>\$583</b>	<b>7</b>	<b>\$718</b>	<b>9</b>	<b>\$689</b>	<b>8</b>	<b>\$805</b>	<b>10</b>
<i>Avg. of Group</i>	<b>\$560</b>	<b>7</b>	<b>\$718</b>	<b>9</b>	<b>\$689</b>	<b>8</b>	<b>\$805</b>	<b>10</b>
<u>Control Group</u>								
C01	\$840	8	\$1,620	17	\$225	3	\$225	3
C02	\$1,625	12	\$1,625	12	\$1,443	18	\$1,958	23
C03	\$210	3	\$510	5	\$193	4	\$193	4
C04	\$240	4	\$1,404	7	\$250	5	\$963	13
C05	\$2,300	20	\$3,818	37	\$2,315	30	\$2,315	30
C06	\$30	1	\$310	6	\$1,125	14	\$1,133	15
C07	\$200	3	\$870	12	\$573	8	\$607	11
C08	\$120	2	\$1,115	9	\$1,755	20	\$1,755	20
C09	\$40	1	\$160	3	\$200	4	\$200	4
C10	\$300	5	\$720	13	\$1,175	19	\$1,698	23
C11	\$190	2	\$1,045	10	\$315	5	\$323	5
C12	\$250	4	\$3,418	38	\$1,295	23	\$1,828	39
C13	\$0	0	\$40	1	\$468	8	\$468	8
C14	\$1,230	10	\$1,455	15	\$355	8	\$355	8
C15	\$0	0	\$204	3	\$615	8	\$615	8
C16	\$0	0	\$85	2	\$595	14	\$1,520	17
CD1	\$1,020	14	\$1,191	20	\$1,020	14	\$1,191	20
<i>Avg. of Entries</i>	<b>\$614</b>	<b>6</b>	<b>\$1,152</b>	<b>12</b>	<b>\$819</b>	<b>12</b>	<b>\$1,020</b>	<b>15</b>
<i>Avg. of Group</i>	<b>\$506</b>	<b>5</b>	<b>\$1,152</b>	<b>12</b>	<b>\$819</b>	<b>12</b>	<b>\$1,020</b>	<b>15</b>

## **Section Four**

### **Patient and Staff Surveys**

#### Introduction

This section of the report describes the methodology and results of telephone surveying of treatment group and control group members, and of personal interviews with treatment group members and Home Monitoring System staff members.

#### Telephone Survey Methodology

During the month of September 2001, the Docking Institute's University Center for Survey Research interviewed 24 Home Monitoring System (HMS) users (also referred to as the "treatment group") and 15 traditional health care users (the "control group") about the health care they receive. A follow-up survey was conducted during the month of July 2002 with 22 HMS users and 12 traditional health care users<sup>3</sup>. The surveys were conducted using state of the art phone survey methodology with specially selected interviewers.

Prior to each survey period, a letter was mailed to each control group member and treatment group member asking for his or her participation in the research project (see Section 4: Appendix I for sample copy of the letter).

#### Telephone Survey Instruments

The survey instrument used for the HMS users contained 10 survey items, while the survey instrument for the traditional care users contained 8 survey

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<sup>3</sup> Two members of the treatment group and one member of the control group passed away during the course of the project. One additional member of the control group did not wish to participate in the second round of telephone interviews.

items. The Docking Institute constructed survey items to assess patient attitudes toward and experiences with the HMS. In addition, items were constructed to compare the treatment and control groups on self-health assessment and satisfaction with health care services.

### Personal Interviews

In addition to the phone surveys, Docking researchers personally interviewed many of the members of the treatment group and HMS staff. Personal interviewing took place at various times during the study period, including an end-of-project reception for all participants held September 20, 2002.

### Report of Findings

The findings reported here are from the telephone surveys and personal interviews. The findings are categorized under the following heading areas: Satisfaction with Medical Care Received, Satisfaction with the Home Monitoring System, Comfort Level, Component Ease of Use, Staff Responsiveness and Willingness to Help, and Ownership of Health.

#### *Overall Satisfaction with Medical Care*

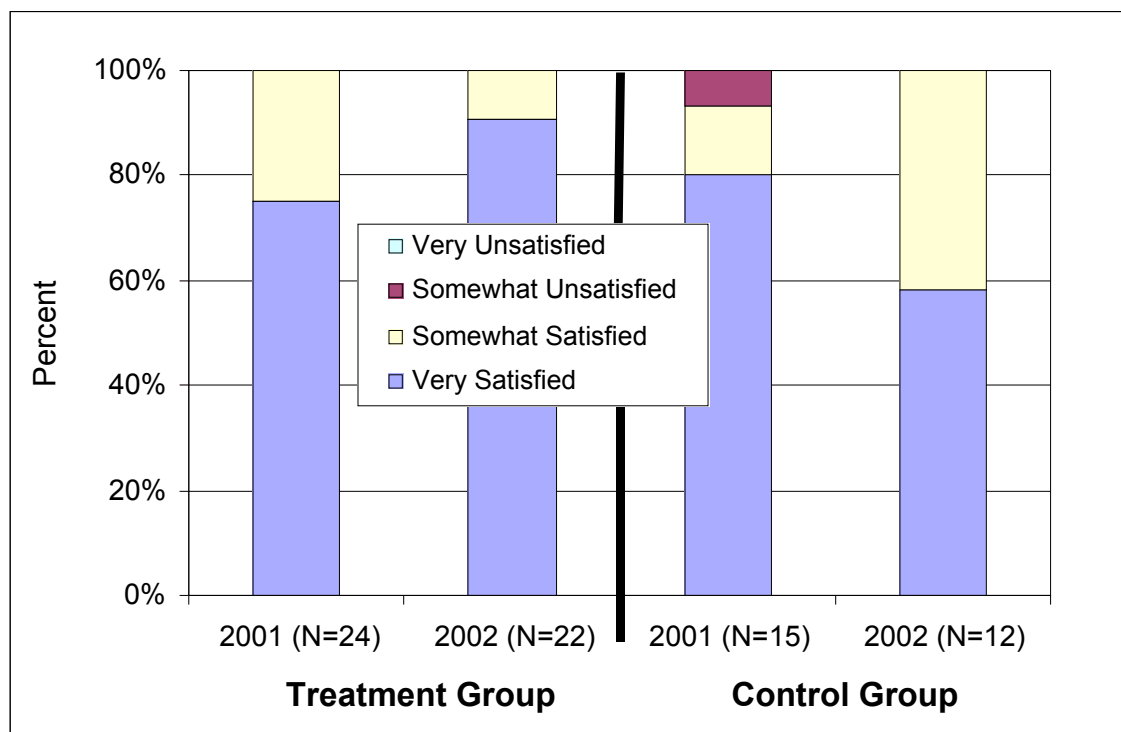
Home Monitoring System users and traditional care users were asked to indicate how satisfied they were with the overall medical care they were receiving. Response options ranged from "Very Satisfied," to "Somewhat Satisfied," to "Somewhat Unsatisfied," to Very Unsatisfied."

As seen in Figure 4.1 (next page), most of the individuals in the treatment group and in the control group were "very satisfied" with the care they were receiving. The blue sections of the stacked columns suggest that about 75% of

the HMS users considered themselves “very satisfied” with their overall health care during the first survey period in 2001, while 80% of the traditional care users considered themselves “very satisfied” with their overall health care during the same survey period.

Generally, members of the treatment group were somewhat more likely to indicate that they were “very satisfied” with the care received than the members of the control group. In addition, treatment group members reporting that they were “very satisfied” increased from about 75% in 2001 to over 90% in 2002, while the opposite trend occurred for the control group.

**Figure 4.1: Satisfaction with Overall Care (Treatment and Control Groups)**



During phone interviews, members from both groups volunteered responses suggesting overall satisfaction with their medical care. For example, during a phone interview, a male control group member said,

“I am very happy with the care that I am receiving since I moved up to Hays. My doctor is top notch and so are the nurses. They really know what they are doing.”

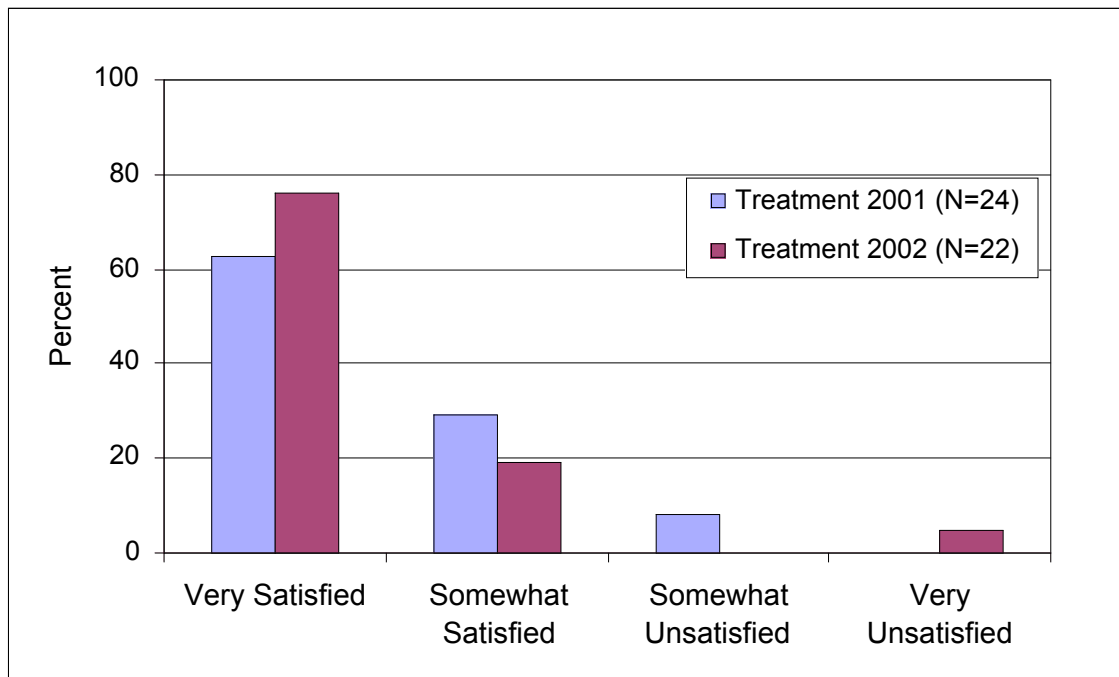
Treatment group members provided similar sentiments about the overall medical care. One female said during an in-person interview:

“I feel really lucky to have such good care, especially in a town the size of Hays. I have lived in bigger cities, but did not have as good of [medical] care as we have here.”

### *Overall Satisfaction with Home Monitoring System*

Treatment group members were asked about their satisfaction with the Home Monitoring System, and were provided with response options ranging from “Very Satisfied” to “Very Unsatisfied.” Figure 4.2 shows that almost all of the treatment group members were “very satisfied” or “somewhat satisfied” with the HMS.

**Figure 4.2: Satisfaction with HMS (Treatment Group Only)**



In addition, satisfaction with the HMS increased with time as slightly more than 60% were “very satisfied” at the beginning of the project, but about 75% indicated that they were “very satisfied” with the system during the follow-up phone interview.

During in-person interviews, treatment group members also suggested overall satisfaction with the system. A sampling of comments includes:

From a male participant – “While it has a few bugs, it could be developed into a winning thing.”

From a female participant – “I really like it, and I will miss it when it is gone.”

From a male participant – “I don’t just like using it, I REALLY like using it!”

From a female participant – “I feel very fortunate to have been selected for this study. Having the unit in my home has been very comforting. I wish that other older members of the community could have one in their homes too. I think it could potentially save lives, and certainly gives me a sense of comfort to know that my medical condition is being monitored daily.”

HMS staff members also suggested satisfaction with the system on the part of patients. One staff member said,

“We could see that most of the patients really enjoyed having the systems in their homes, and knowing what their vital signs were on a daily basis.”

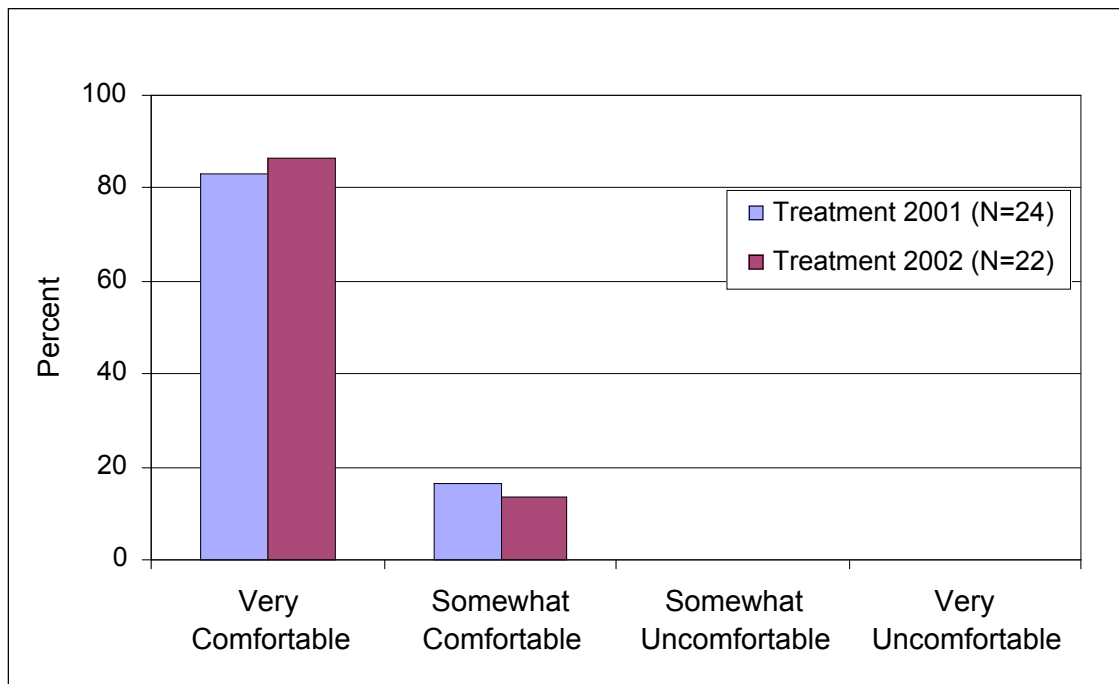
Another staff member added,

“We have two patients that still have the equipment in their homes and don’t want to give it up. That should tell you something! We had a lot of disappointed patients when they were told that we were picking up the equipment. It makes them feel better knowing their vital signs are being watched.”

### *Overall Comfort Level with Home Monitoring System*

Treatment group members were asked to indicate their overall comfort level with the system. Response options ranged from "Very Comfortable" to "Somewhat Comfortable" to "Somewhat Uncomfortable" to "Very Uncomfortable." Figure 4.3 shows that most users were "very comfortable" with using the system, and that none of the users were "uncomfortable" at all with using the system. Importantly, comfort levels seemed to increase with time, as more members of the treatment group indicated that they were "very comfortable" in 2002 than in 2001.

**Figure 4.3: Overall Comfort Level (Treatment Group Only)**



During in-person interviews, HMS users and staff members also suggested that treatment group members were comfortable with the system. Comments from users included:

From a male participant – "They really explained how to use the equipment, and it was really simple."

From a male participant – "I really liked using the equipment. It was no problem at all once I got used to it."



HMS staff members commented:

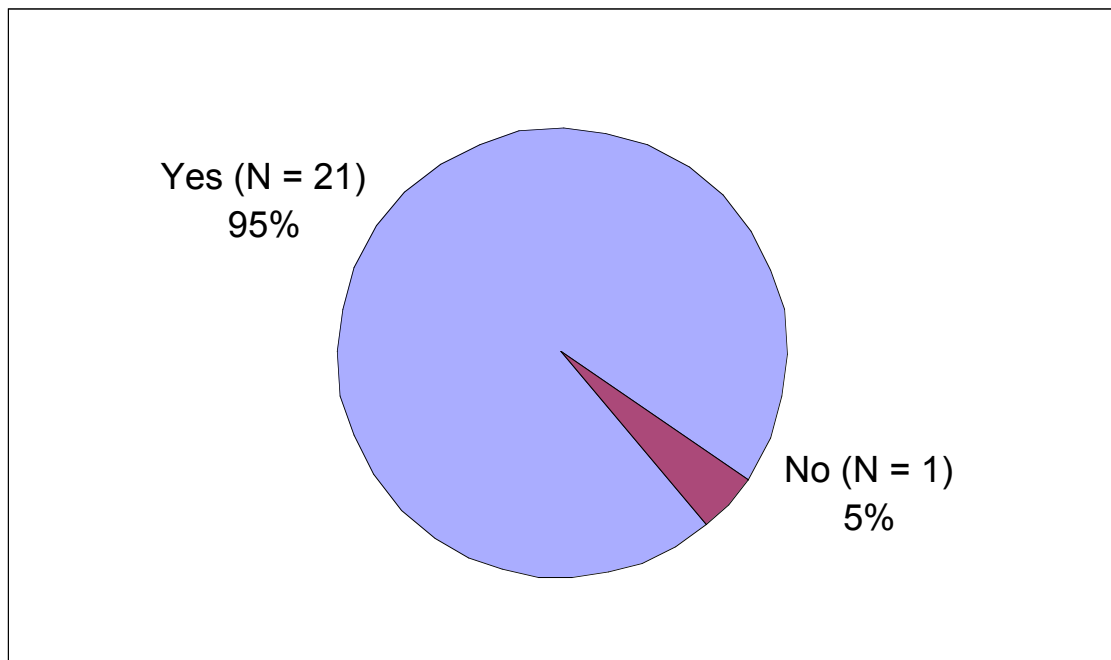
“The equipment was fairly simple to explain to the patients. They picked up on how to use the equipment rather quickly and they seemed comfortable with it.”

“Most of the equipment didn’t require much attention, and most problem could be resolved over the phone.”

“I was surprised at first at how well the patients did with the machines. Some of them have personal computers and were comfortable with the technology, generally.”

In addition, treatment group members were asked if they recommend the system to other family members and/or friends. At the end of the study, almost all said that they would recommend the HMS to others (see Figure 4.4).

**Figure 4.4: Recommend System to Others (Treatment Group Only)**



During in-person interviews, treatment group members also recommended the HMS to other people with similar health conditions. A sample of comments include:

From a female participant – “I wish that other older members of the community could have one in their homes too.”

From a female participant – “I know a lady at my church who could really use a one.”

From a female participant – “Yes, it is really nice to have the monitor and to have the calls from Kay and Sarah. I think other people would like to have the monitor in their homes if they could. I think that would be a good idea.”

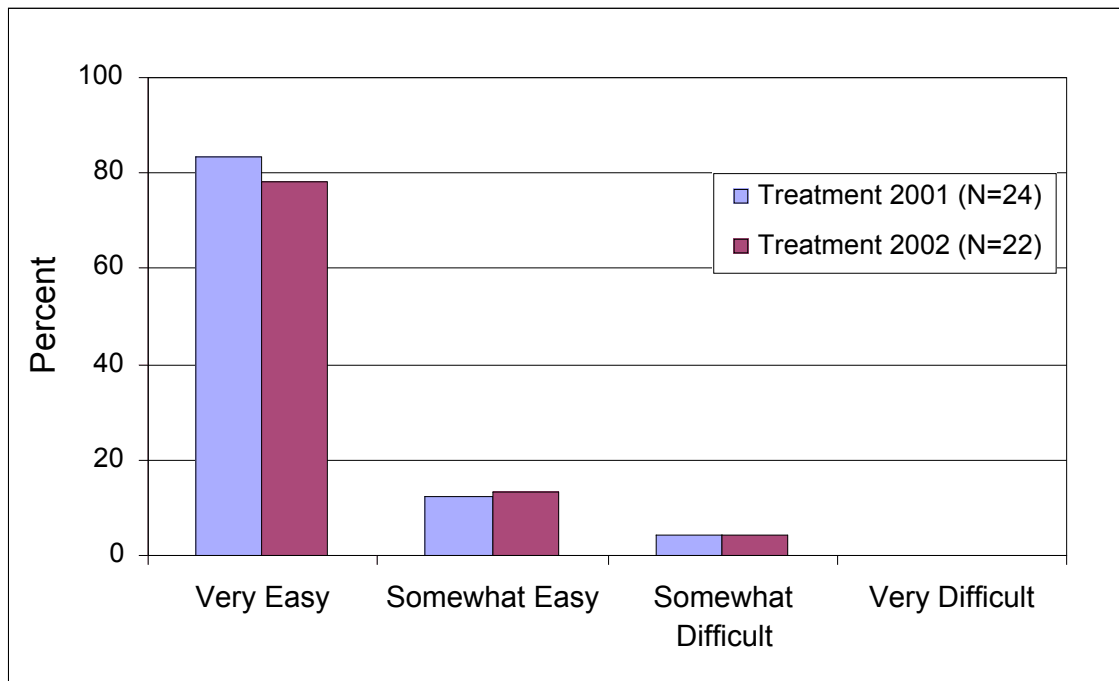
From a male participant – “It’s really great. I feel much better having it there. I recommend one for everyone that is in the same kind of condition as me. It is really nice to be able to check yourself out during the day without having to run to the doctor every time you are feeling a little run down.”

### *Component Ease-of-Use*

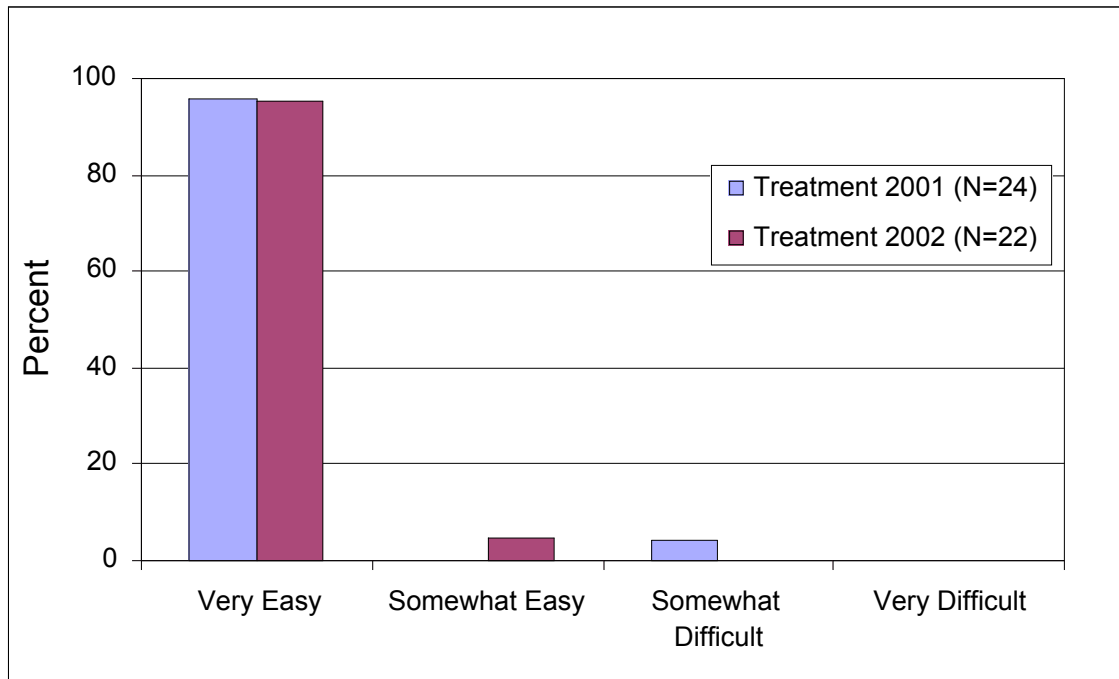
HMS users were also asked to indicate how easy or difficult they felt that the various components of the HMS system were to use. The main components include a blood pressure cuff, an oximetry device, a weight scale, and a spirometry device. Each component was read, and respondents were asked to indicate if the component was "Very Easy" to use, "Somewhat Easy" to use, "Somewhat Difficult" to use, or "Very Difficult" to use.

Figures 4.5, 4.6, and 4.7 (beginning on next page) show that most users found all of the components "very easy" to use. All of the respondents indicated that the weight scale was “very easy” to use, and those responses are not shown in a figure.

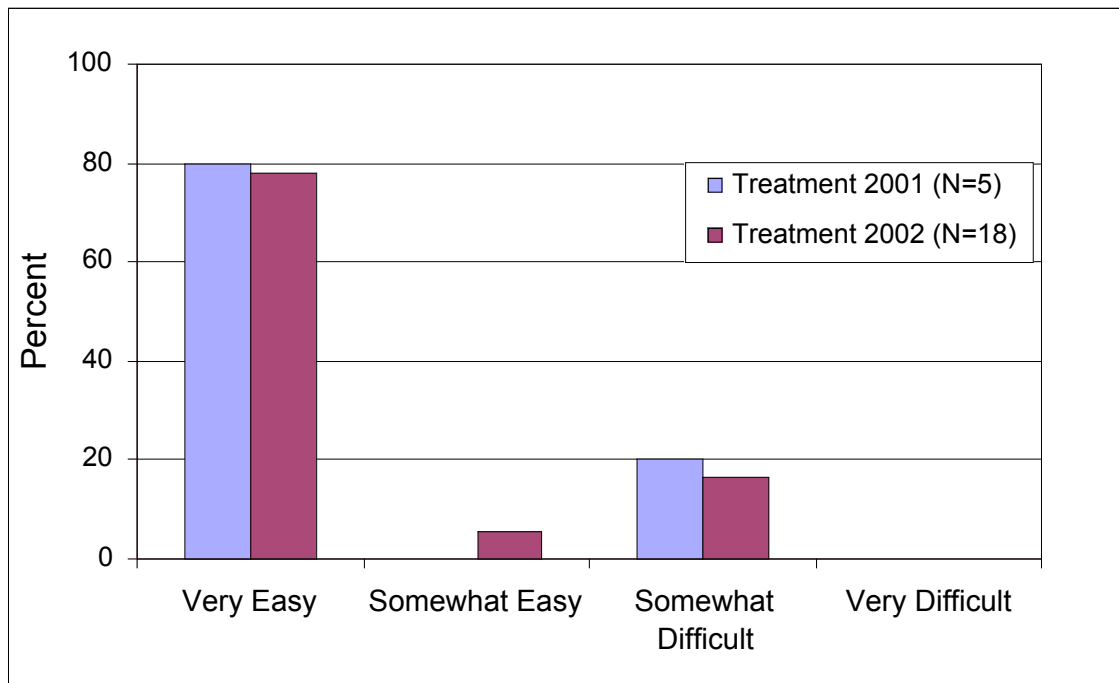
**Figure 4.5: Component Ease of Use -- Blood Pressure Cuff (Treatment Group Only)**



**Figure 4.6: Component Ease of Use -- Oximetry Device (Treatment Group Only)**



**Figure 4.7: Component Ease of Use -- Spirometry Device (Treatment Group Only)**



While most members of the treatment group found the majority of the components “very easy to use,” the spirometry device was the most problematic. While the health conditions of some members of the treatment group did not warrant the use of the spirometry device, the low number of users during the initial phone survey (see Treatment 2002 (N=5) in Figure 4.7) is due primarily to the spirometry device not working properly during that time frame.

During in-person interviews, comments like “the spirometry device just didn’t want to work” were common. A male commented that it “broke so many times, but the staff were really fast at fixing it.” A female said, “I do not understand what the spirometry readings mean and they seem to change all the time,” suggesting either a misunderstanding on the part of the patient or a defective component.

Concerning the blood pressure cuff, two participants suggested that it was “somewhat difficult” to use. A male said the he had to “lean up against the wall to put it on himself,” suggesting that either additional user training and/or self-standing cuff might be in order for such a patient. Another male said, “I don’t think it works right. It always reads like my blood pressure is about to explode.”

HMS staff members also commented on the equipment. One member reported, “this system’s weight scale seemed to work better than some of the other units we looked at. Plus, [the manufacturer] supplied larger and smaller size blood pressure cuffs for different sized patients.” However, another staff member said, “I think the support system from the manufacturer was very poor. When we sent them equipment that was defective, it took forever to get it back.”

### *Staff Responsiveness and Willingness to Help*

To assess how the patients perceived the responsiveness and helpfulness of medical staff members, a number of questions were asked to address these issues. These included how fast phone calls were returned to patients, overall experience with HMS staff members, and whether traditional care users felt they could “see a provider right away” if needed.

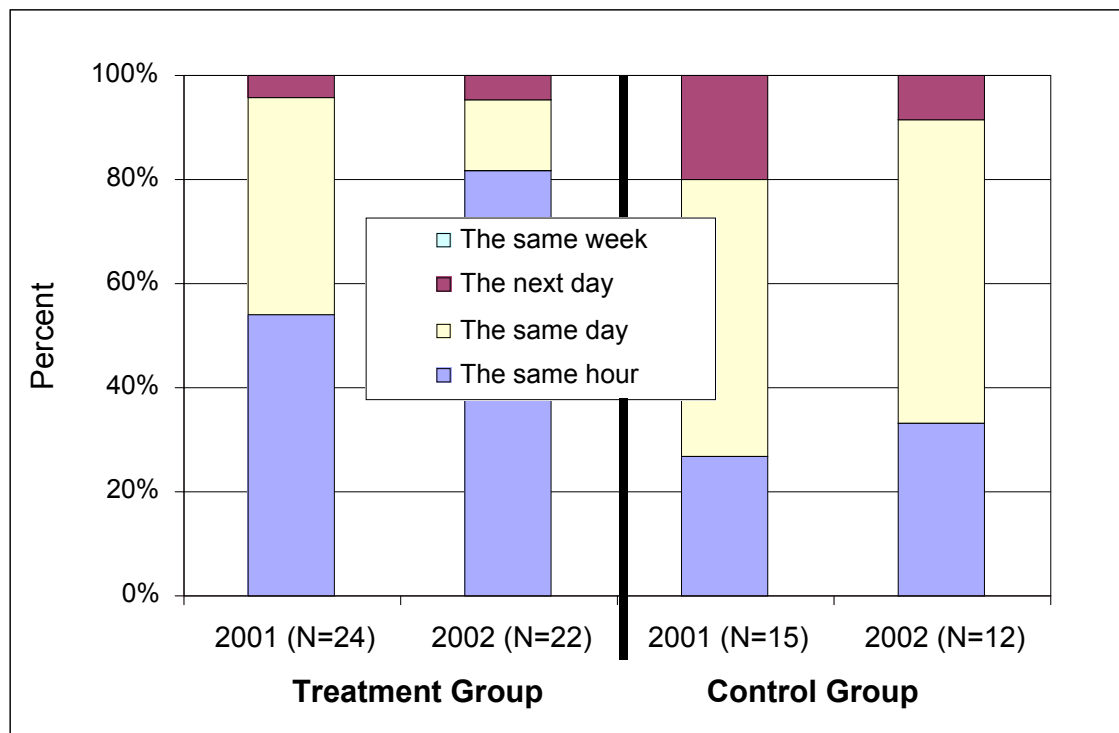
Members of the treatment group and the control group were asked to indicate how long it usually took for a telephone call to be returned from medical staff members when requested. Response options included “within the same hour,” “within the same day,” “within the next day,” “within the same week,” and “longer than a week.”

Figure 4.8 (next page), suggests that most respondents from both groups find that phone calls are returned very quickly from medical staff members. The blue sections of the stacked columns suggest that about 55% of the HMS users

reported their phone calls returned within the same hour, while 25% of the traditional care users reported the same during the same survey period.

At least 80% of the members of both groups (and during both survey periods) suggested that their phone calls were returned during the same day, while none of the participants from either group indicated waiting for a returned call longer than one day. This level of “customer service” might contribute to the high level of overall satisfaction presented in Figure 4.1. Additionally, the quicker response from HMS staff members suggests beneficial consequences for having nursing staff members dedicated to servicing telephone inquiries.

**Figure 4.8: Phone Calls Returned (Treatment and Control Groups)**



Many members of the treatment group volunteered open-ended responses to this survey question. Most suggested that contact from HMS staff members was consistent, comforting, and proactive. The comment “Kay and Sarah call us everyday to see how we are doing, so we don’t need to call them” or something similar was common. In addition, during in-person interviews phrases like “if they didn’t call us, we would call them” and “if I didn’t get a call in the morning, I would call [Sarah or Kay] to make sure she was alright” were common. These responses suggest that treatment group members enjoyed and became accustomed to the daily contact afforded them by the project. During personal interviews, HMS staff members suggest the same:

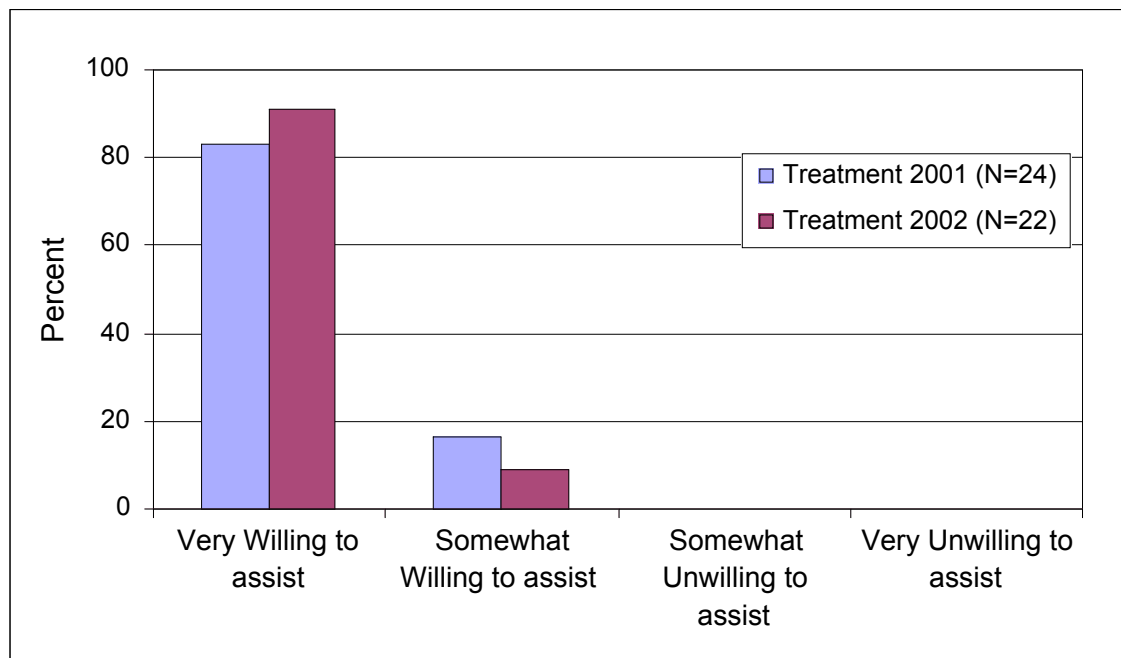
“I think we had a very good support system for the patients. They knew that they could call us and we could talk them through almost any problem. Most [of the patients] really seemed to love talking to us. They were not only our patients but became our friends.”

“When one of our first patients passed away during the project, Sarah and I went to the funeral. The family told us

that he enjoyed participating in the program and felt his contribution was very important. His wife also told us that he looked forward to his daily calls from his “girlfriends.” We made some good friends here.”

To further assess the treatment group’s opinions about the responsiveness of HMS staff members, HMS users were asked to indicate how willing HMS staff members were to assist patients. Response options ranged from "when you call, you feel that staff members are very willing to assist you," ". . . somewhat willing to assist you," ". . . somewhat unwilling to assist you," to ". . . very unwilling to assist you." Figure 4.9 shows that most of the treatment group members indicate that they feel that staff members are "very willing" to assist them.

**Figure 4.9: Experience with HMS Staff (Treatment Group Only)**



Through personal interviews, the same theme emerged. One female treatment group member said:

“They would do anything to help us. No matter when we called, they were always friendly and helpful. I know that I



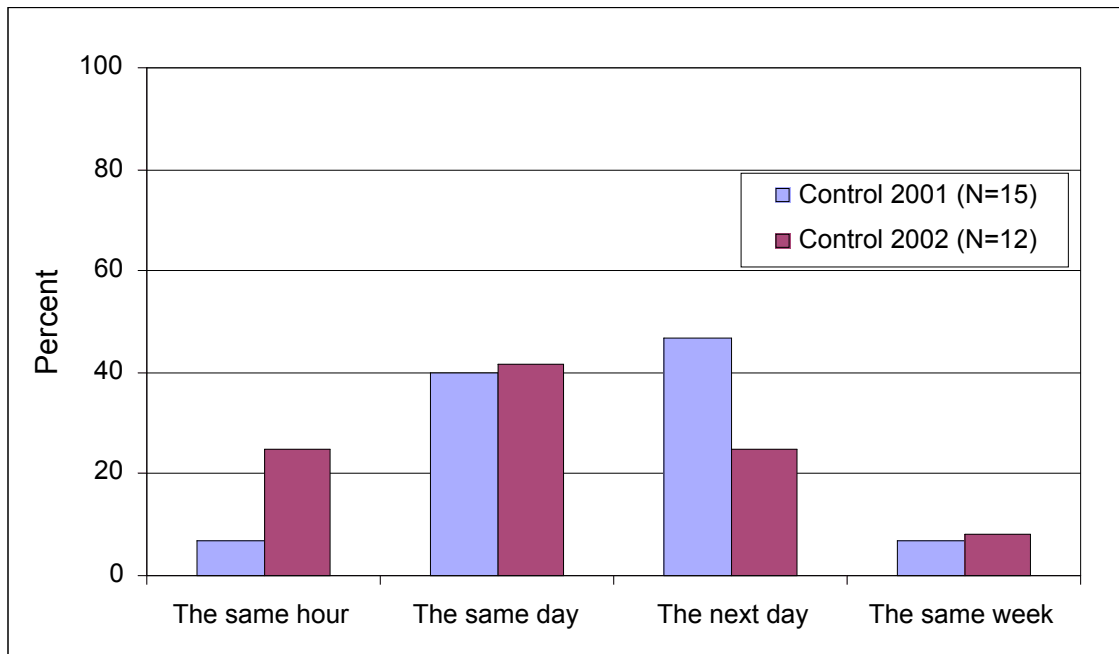
would not have wanted to continue to be part of the program without Kay and Sarah on the other end of the phone.”

Another added:

“Not only were they always helpful on the phone, but one of them would come out to the house to fix a problem at the drop of a hat. Dennis made a trip out to my house many times to fix something or other, and he was very nice too.”

Concerning the responsiveness and helpfulness of traditional care provider staff, control group members were asked during the telephone surveys if they felt they were "able to see someone right away or at least within the next hour," "...the same day," "...the next day," or "...the same week." Figure 4.10, shows that most of the members of the control group felt that they are able to see their provider quickly.

**Figure 4.10: See Provider Right Away (Control Group Only)**



These findings suggest that traditional care providers in the Hays area are very responsive to their patients, and this suggestion is supported by the data provided in Figure 4.11 (next page). It is not known at this time, however, if the HMS could have reduced the need for some control group members to visit their care providers. Data from treatment group member interviews suggest that the HMS did provide a level of patient confidence:

From a male participant – "I have a nurse that visits me daily to help out. She looks at the daily information in the morning to see how I am doing. I think this is really smart!"

From a female participant – “I have a hard time getting to doctor’s office sometimes because I don’t drive. I like that the information is sent in every day.”

**Figure 4.11: Satisfaction with Doctor's Appointments (Control Group Only)**

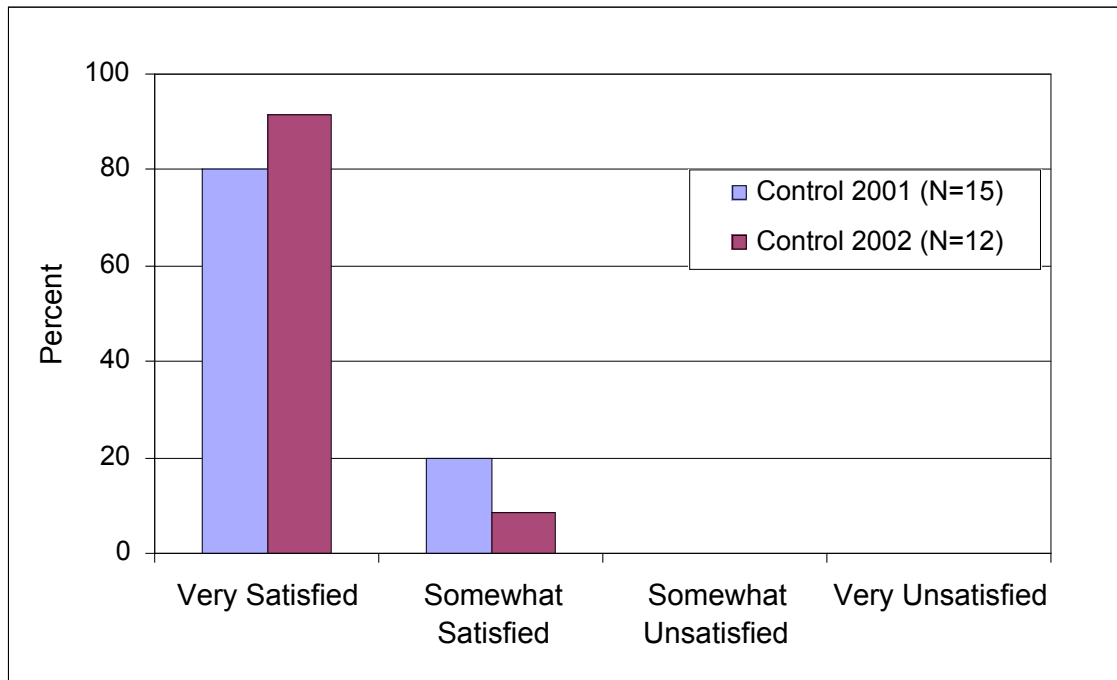


Figure 4.11 suggests that control group members are generally very satisfied with their appointments. This supports the finding presented about overall care in Figure 4.1. A few control group members voluntarily suggested that, while they “really like Dr. X<sup>4</sup>” or are “very satisfied with the care received from Dr. Y<sup>2</sup>” they desired to “not go in for so many appointments because it was often very hard to get in.”

<sup>4</sup> For purposes of anonymity, physician names were not included.

## *Ownership of Health*

An unplanned outcome of this research project was the discovery that treatment group members generally felt that the HMS gave them a strong sense of control over their medical care. Many volunteered responses during the structured telephone interviews that indicated that the HMS provided a feeling of security. These comments illustrate this point:

From a female participant – “It could be a real life-saver to people. I know that I worry less now that the machine is taking my vital signs every day.

From a female participant – “I like knowing that they [the HMS staff] are looking out for me. I know that if the monitor tells them that something is wrong, they will give me a call to check up on me.”

From a male participant – “Sometimes when I will wake up in the morning and know that something isn’t right, I know that the machine will send the information to the girls. And when they call, we will talk about it. If they think it is serious enough, they will talk to a doctor about it. I really like knowing they are there.”

From a male participant – “I was in the hospital a month ago because of the home monitoring system. It was recording that my heartbeat was too fast. I found out later that it was an ‘arterial flutter’ or something like that. If it wouldn’t have been for the system, I don’t know what would have happened. I probably wouldn’t be here talking to you!”

During in-person interviews some treatment group members even suggested that the HMS provided them with regular access to health care, heretofore unavailable to them. Examples include:

From a female participant – “I live a bit of a drive away from Hays, and it is often hard for me to get into town. You see, I don’t drive anymore, and I don’t want to be a bother to [daughter’s name]. She lives in [town name] and has her own family, and is very busy with her own children. So, when I was selected to be part of this study, I was glad. Now [physician’s name] can get my information without me having

to go in. And when Kay or Sarah call, I feel like a real patient.”

From a male participant – “I still get around pretty good, but I know this could really help some other people. I think that linking the doctor and older people in smaller towns is a good idea. I know that sometimes is difficult enough for me to make it in [to an appointment] sometimes. I don’t know how some do it. The Home Monitoring System just might be the way to link people up with their doctors.”

Finally, at the September 20, 2002 reception, quite a few (about seven) members of the treatment group mentioned that being part of the HMS study gave them a new appreciation for their health care, and that they could take a more active role in managing their own health care. For example:

From a male participant – “One thing I noticed was that after the machine would take my readings, I would get out and take a walk if the weather was good. I would usually hang around the house more, but since I saw my readings everyday, I thought I should try to improve them.”

From a male participant – “Me too. Plus I want to see if Sarah would notice if my readings changed!”

From a male participant – “Plus [wife’s name] wouldn’t let me eat so much. [She would say] ‘Kay and Sarah will know!’”

From a female participant – “I also found myself watching what I eat a bit more. And getting out more. I felt that I should get out of the house more too. I would check the unit to make sure that I was doing OK before going out. Before being part of this project, I would usually feel too nervous about going out, even to the store. But now I feel that I should get out more, and that I can.”

## Conclusion

From analysis of survey results and the personal interview, it is concluded that members of both the control group and treatment group are satisfied with the medical care that they receive. However, while both groups showed high levels of satisfaction with their overall health care, the treatment group's satisfaction increased over the study period, and the control group's satisfaction declined. In addition, the Home Monitoring System finds overwhelming support from users. The system seems to be very easy to use for most patients, and the HMS staff is very responsive (and proactive) when addressing patient concerns.

An additional important finding of this research project is that treatment group members enjoyed and benefited from the daily personal contact with HMS staff members. While it is beyond the scope of the current research to exam this further, it would seem that the personal daily telephone contacts and periodic personal visits afforded the treatment group with needed social interaction and stimulation.

Another important finding of this research project was the strong sense of health ownership that the HMS provided to treatment group members. This was not accounted for at the design stage of this research project, but during the telephone surveys and in-person interviews, many treatment group members expressed a sense that the HMS instilled in them feelings of security, independence, and health ownership.

## **Appendix I: HMS Letter**

September 6, 2001

Dear Hays Medical Center Home Monitoring participant:

Each person receiving this letter is involved with the Home Monitoring Grant at Hays Medical Center. Some of you have equipment in your homes and are called daily by either Sarah or Kay; others have no equipment but have agreed to be called about your progress from time to time. It is very important for us to understand your satisfaction with Hays Medical Center, your doctor, and the Home Monitoring Grant project.

The Docking Institute of Public Affairs is performing the research survey at Fort Hays State University in cooperation with Hays Medical Center. Your assistance in this study is very important. In order for us to make accurate assessments about the care that we provide, we ask you to participate in this research project.

Docking Institute interviewers will telephone you in about a week. The survey should last approximately three minutes, and you will be asked questions regarding Hays Medical Center and the Home Monitoring System if you have one in your home.

Please be assured of complete confidentiality. Your name will not appear anywhere on the survey, and once your survey is complete your phone number will be removed from the list of interviewees. The Docking Institute will collect and analyze the data, and deliver a report to HMC. Neither Hays Medical Center nor your doctor will see the individual results of the survey. When the study is complete, the report will be made available on the Docking Institute's web site ([www.fhsu.edu/docking](http://www.fhsu.edu/docking)).

If you have any questions about this survey, please call Mike Walker at (785) 628-5563 or Dr. Joe Aistrup at (785) 628-4189 at the Docking Institute. Thank you for your assistance in this important study.

Kay and Sarah  
Hays Medical Center  
Home Monitoring Grant Project



## **Appendix II: Home Monitoring System User Survey**

Hello, my name is (YOUR FIRST NAME). I am calling from Fort Hays State University on behalf of the Hays Medical Center to ask you a few questions about your satisfaction with your home-monitoring system. May I ask you a few questions?

My first question deals with your satisfaction with the OVERALL medical care you are receiving. Do you feel that you are Very Satisfied, Somewhat Satisfied, Somewhat Unsatisfied, or Very Unsatisfied with your overall care?

- [Q1]    1 VERY SATISFIED  
          2 SOMEWHAT SATISFIED  
          3 SOMEWHAT UNSATISFIED  
          4 VERY UNSATISFIED  
          8 Don't Know  
          9 No Answer

Now, turning to your home-monitoring system specifically, are you Very Satisfied, Somewhat Satisfied, Somewhat Unsatisfied, or Very Unsatisfied with your home-monitoring system?

- [Q2]    1 VERY SATISFIED  
          2 SOMEWHAT SATISFIED  
          3 SOMEWHAT UNSATISFIED  
          4 VERY UNSATISFIED  
          8 Don't Know  
          9 No Answer

I understand that there are four basic parts to the home-monitoring system: the blood pressure cuff, the oximetry device, the weight scale, and the spirometry device. I will read each component again and ask you if it is Very Easy, Somewhat Easy, Somewhat Difficult, or Very Difficult to use?

[Q3a] the blood pressure cuff

- 1 VERY EASY  
          2 SOMEWHAT EASY  
          3 SOMEWHAT DIFFICULT  
          4 VERY DIFFICULT  
          8 Don't Know  
          9 No Answer

[Q3b] the oximetry device [the cylinder that you put your finger into]

- 1 VERY EASY
- 2 SOMEWHAT EASY
- 3 SOMEWHAT DIFFICULT
- 4 VERY DIFFICULT
- 8 Don't Know
- 9 No Answer

[Q3c] the weight scale

- 1 VERY EASY
- 2 SOMEWHAT EASY
- 3 SOMEWHAT DIFFICULT
- 4 VERY DIFFICULT
- 8 Don't Know
- 9 No Answer

[Q3d] the spirometry device [the tube that you blow into]

- 1 VERY EASY
- 2 SOMEWHAT EASY
- 3 SOMEWHAT DIFFICULT
- 4 VERY DIFFICULT
- 8 Don't Know
- 9 No Answer

Thinking about your OVERALL COMFORT LEVEL with using your home-monitoring system, are you Very Comfortable, Somewhat Comfortable, Somewhat Uncomfortable, or Very Uncomfortable, with using the system?

- [Q4]
- 1 VERY COMFORTABLE
  - 2 SOMEWHAT COMFORTABLE
  - 3 SOMEWHAT UNCOMFORTABLE
  - 4 VERY UNCOMFORTABLE
  - 8 Don't Know
  - 9 No Answer

When you need to reach someone to help you with the system, are you are able to SPEAK with someone RIGHT AWAY or at least within a few minutes?

- [Q5a]
- 1 YES
  - 2 NO
  - 8 Don't Know
  - 9 No Answer

Is your telephone call returned within:

[Q5b] [READ THE RESPONSES]

- 1 the same hour?
- 2 the same day?
- 3 the next day?
- 4 the same week?
- 5 longer than a week?
- 8 Don't Know
- 9 No Answer

Thinking about when you speak with a staff member about the system, which of the following statements best describes your experience:

- [Q6] 1 when you call, you feel that the staff members are very willing to assist you.
- 2 the staff members are somewhat willing to assist you.
  - 3 the staff members are somewhat unwilling to assist you.
  - 4 the staff members are very unwilling to assist you.
  - 8 Don't Know
  - 9 No Answer

Would you recommend a home-monitoring system to friends and relatives?

- [Q7] 1 YES
- 2 NO
  - 8 Don't Know
  - 9 No Answer

[Q8] Is there else anything that you would like to mention about your care?

[Q9] Was the respondent male or female?

[Q10] Date survey completed

Okay, that's all the questions I have. Thank you very much for your time. [HANG UP]

### **Appendix III: Traditional Health Care User Survey**

Hello, my name is (YOUR FIRST NAME). I am calling from Fort Hays State University on behalf of the Hays Medical Center to ask you a few questions about your satisfaction with your medical care. May I ask you a few questions?

My first question deals with your satisfaction with the OVERALL medical care you are receiving. Do you feel that you are Very Satisfied, Somewhat Satisfied, Somewhat Unsatisfied, or Very Unsatisfied with your overall care?

- [Q1]    1   VERY SATISFIED  
          2   SOMEWHAT SATISFIED  
          3   SOMEWHAT UNSATISFIED  
          4   VERY UNSATISFIED  
          8   Don't Know  
          9   No Answer

I understand that you see your health care provider on a regular basis to monitor your medical condition. Would you say that you are Very Satisfied, Somewhat Satisfied, Somewhat Unsatisfied, or Very Unsatisfied with you doctor appointments?

- [Q2]    1   VERY SATISFIED  
          2   SOMEWHAT SATISFIED  
          3   SOMEWHAT UNSATISFIED  
          4   VERY UNSATISFIED  
          8   Don't Know  
          9   No Answer

When thinking about the timing of these appointments, would you say you are seeing your provider MORE OFTEN than you need to, LESS OFTEN than you need to, or OFTEN ENOUGH to monitor your condition?

- [Q3]    1   MORE OFTEN THAN NEEDED  
          2   LESS OFTEN THAN NEEDED  
          3   OFTEN ENOUGH  
          8   Don't Know  
          9   No Answer

OK, please think about the times when you need to SPEAK to your provider right away because of a medical problem.

When you call are you able to speak to your provider right away or at least within a few minutes?

- [Q4a]
- 1 YES
  - 2 NO
  - 8 Don't Know
  - 9 No Answer

Is your telephone call usually returned:

[Q4b] [READ ALL RESPONSES]

- 1 the same hour?
- 2 the same day?
- 3 the next day?
- 4 the same week?
- 5 longer than a week?
- 8 Don't Know
- 9 No Answer

Please think about the times when you need to SEE your provider right away because of a medical problem, and not during a scheduled appointment.

Can you usually make an appointment to SEE your provider right away or at least within an hour?

- [Q5a]
- 1 YES
  - 2 NO
  - 8 Don't Know
  - 9 No Answer

Can you see the provider:

[Q5b] [READ ALL RESPONSES]

- 1 the next hour?
- 2 the same day?
- 3 the next day?
- 4 the same week?
- 5 longer than a week?
- 8 Don't Know
- 9 No Answer

[Q6] Is there else anything that you would like to mention about your care?

Okay, that's all the questions I have. Thank you very much for your time. [HANG UP]

[Q7] Was the respondent male or female?

[Q8] Date survey completed

## Appendix IV: Patient Data – Alpha Form

This form is for patient

Date: \_\_\_\_\_ Enter Date: \_\_\_\_\_

Time: \_\_\_\_\_ Enter Time: \_\_\_\_.

Last Name: \_\_\_\_\_

First Name: \_\_\_\_\_

Social Security Number: \_\_\_\_\_

Patient Number: \_\_\_\_\_

Attending Physician: \_\_\_\_\_

Is the patient available? \_\_\_\_\_ 1. yes 2. no

If no: Why unavailable? \_\_\_\_\_ 1. Gone 2. Hospital - CHF, COPD  
3. Hospital - Other 4. Dropped out  
5. Deceased 6. Nursing Home 7. Other

If no: Date beginning: \_\_\_\_\_

Call Patient now: Phone Number: \_\_\_\_\_

Q1. \_\_\_\_ How do you feel today?

Excellent	Average	Poor	Can't Determine
1 2	3 4 5	9	

Q2. \_\_\_\_ What is your activity level today?

Excellent	Average	Poor	Can't Determine
1 2	3 4 5	9	

Q3. \_\_\_\_ How is your appetite today?

Excellent	Average	Poor	Can't Determine
1 2	3 4 5	9	

Q4. \_\_\_\_ How is your respiratory effort today?

Excellent	Average	Poor	Can't Determine
1 2	3 4 5	9	

Q5.\_\_\_\_ How did you sleep last night?

Excellent	Average	Poor	Can't Determine
1 2	3 4	5	9

If below average:

Q5a.\_\_\_\_ Did you wake up short of breath?

1. yes
2. no

Q5b.\_\_\_\_ Did you have to sit by the side of the bed?

1. yes
2. no

Q5c.\_\_\_\_ Did you take any extra treatments?

1. yes
2. no

Q5d.\_\_\_\_ Do you have any new chest pains or discomfort?

1. yes
2. no

Blood Pressure Data

Spirometer Data

Systolic \_\_\_\_ PEFR \_\_\_\_

Diastolic \_\_\_\_ FVC \_\_\_\_

Pulse Rate \_\_\_\_ FEV1 \_\_\_\_

MMEF \_\_\_\_

Weight: \_\_\_\_

Oximeter

O2 Saturation \_\_\_\_

Did the tech contact attending physician office? \_\_\_\_\_ 1. yes 2. no

Initials \_\_\_\_